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Contents

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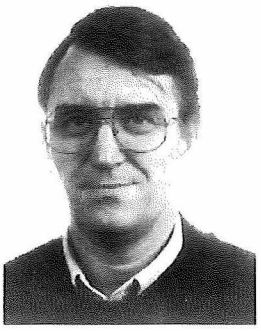
Editorial

Dear URSI Correspondent,

Welcome to the winter issue of your Bulletin. We have the pleasure to host this time the editor in chief of one of our major scientific URSI journals. Bob Hunsucker presents in a short article some interesting historical notes on "Radio Science" along with several very useful informations I suggest you will read carefully.



In a more philosophical style, we also have a letter to the editor by which we have the opportunity to be questionned on some issues and thoughts suggested by Ari Shivola about modern science and postmodernism, as well as about publishing policies in scientific societies.

For the vitality of our Union, it is important to know each other. In the section concerning News from the URSI Community, we start with this issue a new item devoted to the presentation of particular scientific groups around the world. Presented as a "Profile of a Department" you will have the possibility to read two contributions, by Professor Sluijter of the Dutch committee and Dr. Hallikainen from Finland, who prepared articles about radio science in their territory, their department or the academy of sciences to which they belong. In view of this new initiative I invite other Member Committees to do the same, i.e. to prepare and to send us a two to four page article presenting the activities of their corresponding groups.

In the other sections, as usual you will find reports on conferences we have recently sponsored, news from the Indian Committee. An address "in memoriam" of Professor Coutrez, who contributed many years for the benefit of our Union, is also included. Finally it is traditional to find in this last issue of the year the address list of all URSI Officials. This is a valuable tool that allows us to stay in touch one with the other.

I wish you a pleasant reading.

Piotr Sobieski, Editor

Letter to the Editor

The Sokal hoax and radio science

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With his article "Transgressing the boundaries—toward a transformative hermeneutics of quantum gravity" in 1996 in the journal *Social Text* [1], the New York University physics professor Alan D. Sokal started a bitter controversy between the theoretical physics community and the so-called postmodernists. As is well known, the naively realistic view of physicists and engineers that there exists a world independent of us and we are able to acquire knowledge about it is not shared by many of our university colleagues in the humanities departments. Especially the cultural studies programmes in many universities in France and USA with background in the continental structuralistic philosophies have emphasised that all science is subjective. So also physics: the results we get with our experiments are dependent on and affected by our preconceptions about nature and the scientific method, and also on our other inclinations, including social and political opinions.

A physicist or engineer may experience difficulties in accepting such claims. I think Alan Sokal also felt so when he decided to experiment with postmodernist academic community. He, as an expert in quantum field theory, prepared the above-mentioned article consisting of hilarious nonsense where statements about quantum theory and gravitation were mixed psychonalysis and feminist theories, and submitted it to the leading North American journal of cultural studies. The paper was accepted. Then, when the piece was safely in print, Sokal disclosed his hoax, and all hell broke loose, as Sokal himself said. He became famous as few physicists before him. Front-page articles about his experiment appeared in the *New York Times*, the *International Herald Tribune*, the *London Observer*, and *Le Monde*.

What happened? The fact that the text of Sokal's manuscript sounded "good" and flattered the ideological

preconceptions of the editors of *Social Text* [2], secured its publication as a serious article. Obviously the editors did not bother to ask anyone with even a minor knowledge in physics about the suitability of the manuscript for publication. An afterword in which Sokal explains the backgrounds of his experiment was rejected by the same *Social Text* [3]. This is an understandable reaction by the editors but of course their credibility was seriously damaged. And it was not only in the physics community that the postmodernists were regarded as emperors without clothes [4].

What can we learn about Sokal's case? Ethical issues aside (we may have reservations about submitting an article into a scientific journal if we are aware that our article contains claims that are not true), one of the important questions that comes into mind from the Sokal affair is the following: can it happen in our field? Are the editors and reviewers of the journals of radio science and engineering at large objective enough and insensitive to feelings like friendship or fear when deciding about the publishability of an article? Certainly we are able to tell full nonsense apart from bad science and wrong results. But what about if we are not able or do not have time to follow the derivations of a theoretical manuscript. The paper cannot be rejected because of deficient analysis since we found no errors. Often we have to trust the author that she or he has put sufficient effort in checking the calculations. But certainly the possibility of a hoax cannot be ruled out absolutely.

Another question that is worth thinking about is the extent to which the postmodernists are wrong when they claim that the laws of physics are dependent on the observer, or that the laws are perhaps only "social constructions" themselves. Although it is tempting to ridicule the extremes by representatives of deconstructionist and poststructuralistic studies [5], we may ask at whom we are really laughing. As Mara Beller has shown in her recent article in *Physics Today* [6], the founding fathers of quantum mechanics produced—among their scientific works—texts which are really obscure and mix clear physics with politics and psychic issues in non-rigorous manner. Born, Bohr, Heisenberg, Pauli, and Einstein have left behind texts which compare well with postmodernist babble. The authority of Niels Bohr was so suppressing that people, when not understanding what the great man was saying would ask what is wrong with them rather than asking whether Bohr was wrong or unclear.

And if we think about our own radioscientific community, which has elements both from physics and engineering, it is perhaps instructive to ask ourselves once more if we are unanimously entrenched into the "scientifically modernist" camp against the postmodernists. The aim of engineers is not necessarily to work for a universal Great Project. Rather, admitting that the world is complex, it is perhaps more useful to take a pragmatic approach as an engineer: try to solve problems when they arise, case-dependently and by small steps. A future avenue for engineering is to move from the all-encompassing deterministic Newtonian paradigm toward openness to other disciplines.

Also, I think that our community admits that radio science is a human endeavour. Technology, relations with other people, and even economics and politics are intertwined with the questions that we try to formulate with Maxwell equations and other laws of physics. Perhaps the social scientists have also something to contribute to the understanding of our activities when these activities are looked at within a general context.

Thinking along these lines, my conclusion is that URSI stands somewhere between the theoretical-physics based philosophy of objectively existing reality and the postmodernist camp in which the observer is emphasised. But perhaps that is just a personal feeling. Being an URSI Correspondent mostly active with Commissions B and F, I guess that the boundary goes between the commissions lines. To conclude with a lighter tone, I would like to make the following classification, even at the risk of heavy protests from our own community.

What are the modern and postmodern camps within URSI? Well, a suitable criterion is whether a certain commission is interested in what "is really there" independent of ourselves (the modernist group), or in man-made objects and structures (postmodernists). This is a crude distinction but I have observed in my URSI colleagues that their modernist/postmodernist character correlates slightly with their commission interests. My classification is the following: the modernist camp within URSI is formed by Commissions A, B, G, H, and J whereas our postmodernist fraction contains Commissions C, D, E, F, and K.

References

[1] A.D. Sokal: Transgressing the boundaries. Toward a transformative hermeneutics of quantum gravity. *Social Text*, Vol. 14, No. 1/2, pp. 217-252, 1996.

[2] The starting sentences of [1] contain, for example: '...poststructuralistic critiques have demystified the substantive content of mainstream Western scientific practice, revealing the ideology of domination concealed behind the facade of "objectivity".'

[3] A.D. Sokal: Transgressing the boundaries: an afterword. *Dissent*, Vol. 43, No. 4, pp. 93-99, Fall 1996. This article was submitted to *Social Text* but rejected by them on the grounds that it did not meet their intellectual standards. Sokal revealed his parody in "A Physicist Experiments with Cultural Studies" *Lingua Franca*, pp. 62-64, May/June 1996.

[4] The Sokal articles, reactions to them, and other discussion can be found from Professor Sokal's web page *http://vesuvius.physics.nyu.edu:80/faculty/sokal.html*

[5] The following extract is from a summary of the arguments in the philosophy of the feminist thinker Luce Irigaray: "In the same way that women are erased within masculinist theories and language, existing only as not-men, so fluids have been erased from science, existing only as non-solids. From this perspective it is no wonder that science has not been able to arrive at a successful model for turbulence [being a problem of fluid flow]."

[6] M. Beller: The Sokal hoax: at whom are we laughing? *Physics Today*, pp. 29-34, September 1998.

In Memoriam

RAYMOND COUTREZ
1916-1998

Professor Raymond Coutrez passed away on 9 March 1998 in Brussels after a short illness. He was born in Ath on 29 July 1916. He graduated from the Université Libre de Bruxelles in 1938, and obtained his Ph. D. in Physics in 1941 for his thesis on "The Dynamics of Spiral Nebulae". In 1948, the title of agrégé was conferred on him for a special thesis entitled "Contribution to the study of the dynamics of stellar systems". He started his career as aspirant to the National Fund for Scientific Research, and later as research fellow at the Francqui Foundation.

Raymond Coutrez joined the Royal Observatory of Belgium as assistant in 1945, to be appointed later as head of the Radio Astronomy and Solar Physics Department. In 1966, he left the Observatory and was appointed as Professor at the Université Libre de Bruxelles and head of its Institute of Astronomy and Astrophysics. There he had already been reader in Astrophysics since 1958 and extraordinary professor since 1960. He had also been lecturing at the Liège University since 1962.

Raymond Coutrez's first investigations were devoted to the field of stellar dynamics and stellar statistics. In 1938, he used the wave theory in order to explain the formation of the spiral structure in galaxies and pointed clearly the role played by density and deformation waves in that phenomenon. Raymond Coutrez pioneering work being highly appreciated by Bertil Lindblad and his team in Sweden, a close collaboration between them was established in 1947. In subsequent years, Raymond Coutrez succeeded in replacing the whole set of relations between mass density and the successive moments of velocities in stellar systems by a single equation, which he called "spectral equation". In that way it became possible to reduce stellar dynamics to two equations, the one just mentioned and the Poisson equation giving the potential. In a series of statistical studies performed with P. Bourgeois on the velocity distribution of type A and B stars of the Galaxy, he derived various effects which were confirmed later by radio observations of the neutral hydrogen 21 cm line.

All these investigations resulted in more than 30 articles in various scientific publications.

In 1955, Raymond Coutrez was awarded the Agathon de Potter Prize by the Belgian Academy of Sciences for his work in astronomy in the period 1952-1954. In 1949, he opened a new field of research at the Royal Observatory by setting up a Solar Physics and Radio Astronomy Service. For that purpose, he devised and realised a nice and preferment instrument, the "automatic equatorial solar table", capable of following the Sun with high accuracy. The instrument included three refractors, one of which was used for visual and automatic photographic observation of the chromosphere and the two others for visual and photographic observation of the photosphere respectively. It was put in operation at the end of 1953 and showed its full capacity during the International Geophysical Year in 1957-58 and the subsequ ent years of international co-operation in geophysics. In 1954, Raymond Coutrez established the radio astronomy station at Humain near Marche-en-Famenne in Belgium. Two radio telescopes for observing the Sun on 169 and 600 MHz, equipped with receivers build by himself et E. Pourbaix, were installed two years later. These two instruments played an active role during and after the IGY as part of the world-wide network of continuous observations of the Sun.

In 1956, R. Coutrez published a remarkable book under the title "Radioastronomie", the first one written in French dealing with that discipline. At a later stage, he devised a 48 antenna interferometer designed for obtaining one and two-dimensional images of the Sun on 408 MHz. One of the original features of this instrument was its electronically swept lobe. The continuous observations were started in August 1972.

When R. Coutrez joined the University of Brussels in 1966, he became in charge of all courses in astronomy and astrophysics. On the other hand, he submitted to the European Space Research Organisation a project for measuring the directional properties of the solar wind in the Earth-Moon region. This was accepted and integrated into the HEOS 1 spatial experience, which was launched at Cape Kennedy in December 1968. That was the first Belgian experience in this field, and entirely new results were obtained from the analysis of the wealth of data so obtained. In 1964, R. Coutrez took the initiative in promoting the construction at the University site of a receiving system for measuring the radio-electrical Doppler effect from artificial Earth satellites. He developed an original method whereby the precise value of the satellite orbit parameters were provided rapidly. He made also investigations in the field of theoretical and nuclear astrophysics.

Professor Coutrez had been an active member of the International Astronomical Union (IAU) since 1952 and of the International Union of Radio Science since1954. He maintained a close interest in URSI affairs, and acted as Assistant Secretary General of the Union from 1960 to 1963. For many years, he represented the Belgian Committee on the URSI Council and on the Commission on Radio Astronomy. He was Secretary of the latter from 1957 to 1963, and Vice-Chairman from 1963 to 1966. In 1957, he accepted the responsibility of forming the International Service of Ursigrams. R. Coutrez was also URSI official representative at the World Administrative Radio Conferences in 1959 and 1963, and on the International Council of Scientific Unions. As a member of ESRO, he organised three international symposia. He was a member of the Council and Secretary-Treasurer of the Benelux Cross Antenna Project (BCAP), which resulted in the achievement of the Aperture synthesis radiotelescope by Earth rotation in Westerbork, Netherlands, inaugurated in 1970. Since 1962, he had been a member of the Instrument Commission of the European Southern Hemisphere Observatory (ESO). He had also been President of the Belgian National Committee for Astronomy (1969-71) and of the Belgian National Committee for Radio Science (1972-75).

When he reached the age of retirement after a very fruitful career rich in innovative actions, Raymond Coutrez retired discreetly, but he kept his interest for science intact. Then he could take part more fully in, and enjoy, his family life; only recently, he became great Grand-father to his delight. Also he could devote more time to piano playing – which he did with great skill, and even to composing. All those who have known Raymond Coutrez will remember his never-failing kindness, his open-mindedness, readiness to help and his unusual energy at work. As is rarely the case, he was both an excellent theoretician and the brilliant designer of original and high performing instruments. All his life was devoted to scientific research and teaching, which he did with great competence and enthusiasm.

R. Gonze

A Brief History and Current Status of the URSI Journal, Radio Science

Robert D. Hunsucker

The international journal, *Radio Science* is published in the USA by the American Geophysical Union (AGU) and is co-sponsored by international URSI. The *Radio Science Bulletin, the Journal of Solar-Terrestrial Physics, Wireless Networks* and *Radio Science* constitute the four officially sponsored URSI periodicals. *Radio Science* welcomes original scientific/engineering contributions on all aspects of electromagnetic phenomena related to physical problems - including the propagation through and interaction of EM waves with geophysical media, biological media, plasmas and manmade structures. Telecommunications, remote sensing of the earth and its plasma envelope and radio astronomy are also included Since *Radio Science* will celebrate its 40th anniversary in 1999, we believe that this brief history may be of interest to the community at this time.

History

The direct lineal predecessor of *Radio Science* was the *Journal of Research of the U.S. National Bureau of Standards (NBS), Part D.-Radio Propagation.* The NBS Journal of Research consisted of Part A.- Physics and Chemistry, Part B.- Mathematics, Part C.- Instrumentation and Part D.-Radio Propagation. Part D was created by NBS as a result of an initiative led by James Wait, Kenneth Norton and other staff members of the NBS Central Radio Propagation Laboratory (CRPL). Dr.Allen Astin, Director of NBS gave the go-ahead in 1958 for Part D at NBS headquarters in Washington, D.C. It was felt that in the post-World War II U.S. scientific publication scene, a new journal was needed in addition to the *Proceedings of the Institute of Radio Engineers (IRE).* The Editorial Advisory Board for Part D -Radio Propagation included scientists from CRPL and several other scientific organizations.

The first issue of the Journal of Research, NBS, Section D-Radio Propagation appeared in July 1959 and contained several significant papers by well-known international scientists such as H.Bremmer, Kenneth Norton, R.M.Gallet, R.A.Helliwell, B.R.Bean and Franklin Roach. The Front cover, Table of Contents and an Editorial by James R.Wait are shown in Figures 1, 2 and 3 respectively.

Early issues of the bimonthly journal. *Part D.-Radio Propagation*, contained many fundamental papers on both experimental and theoretical results in electromagnetics and radio propagation. Some readers considered the journal a bit esoteric because some of the papers were highly mathematical in nature, but the editorial policy was vindicated later by many citations of these papers by other authors. Approximately 50% of the papers in *Radio Propagation* were from authors outside NBS and the US. (In current issues of *Radio Science* the proportion of non-US authors has increased significantly).

In 1966 the journal was renamed *Radio Science, Vol.1,* was sponsored by the US National Commission of URSI, and L.A.Manning of Stanford University was appointed co-Editor, along with J.R.Wait. This arrangement lasted for several years, but subsequent changes in research funding emphases and management policies affected the editorial policy and the contents of the journal. These changes were described by various editorials in those issues.

Another change in the character and content of *Radio Science* occurred in 1966, when the American Geophysical Union (AGU) became the publisher. This was a rather complicated transition, but was accomplished through the efforts of the following individuals who subsequently became Editors of *Radio Science*: C.Gordon Little, Douglass D.Crombie, Sidney A.Bowhill and Lawrence Manning. Later Editors were Thomas B.A.Senior, Akira Ishimaru, K.-C. Yeh, Alan Waterman and David C. Chang. The current Editor is Robert Hunsucker, assisted by the AGU Journals Department head, Fran Peters, by Paul Cooper, the AGU Editorial Assistant and by some twenty Associate Editors (listed inside the front cover). James R. Wait, the founding Editor and first author of Radio Science served for nine years as Editor and as an Associate Editor for twelve years. The review and evaluation of manuscripts submitted to *Radio Science* is greatly abetted by very active Associate

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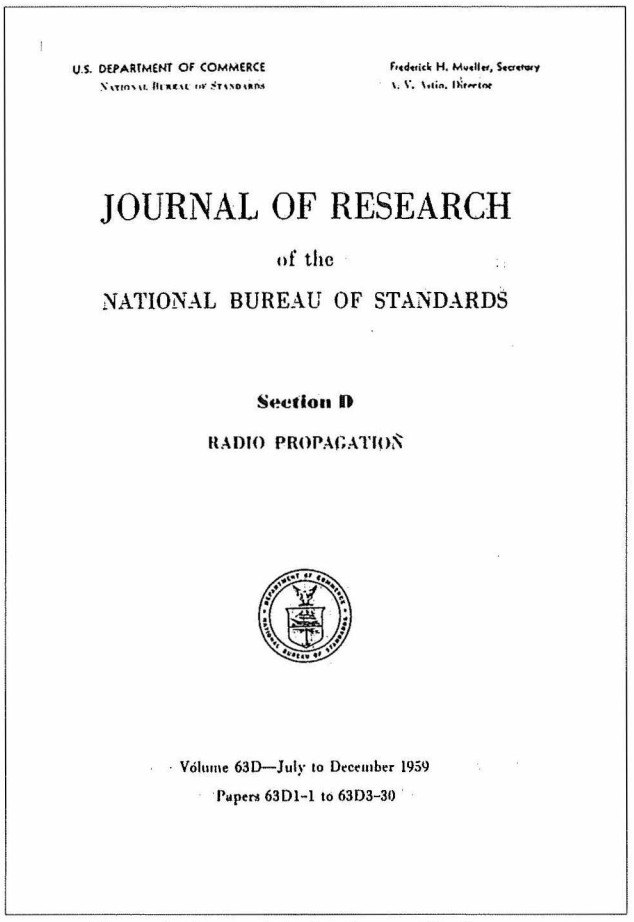

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Section D

RADIO PROPAGATION

Volume 63D—July to December 1959

Papers 63D1-1 to 63D3-30

Figure 1. Cover of the first issue of Radio Propagation - *July 1959*

Editors from the US and abroad representing the international commissions of URSI.

AGU introduced a new typographic look to its journals in 1994. The changes included the use of larger type for the abstracts and captions and boldface type for the titles and section headings in order to enhance the readability of articles and to simplify the process of creating camera-ready copy for the many authors who choose this option.

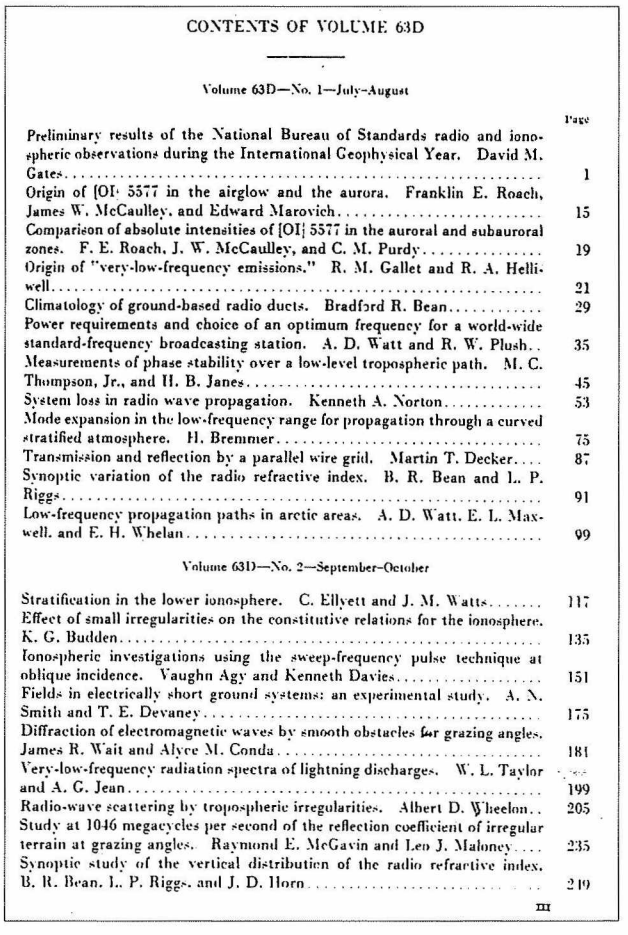
Current Status

The journal is now published bimonthly by AGU and co-sponsored by international URSI, as stated on the front cover. AGU members and *URSI Correspondents* may subscribe to *Radio Science* for their personal use at current subscription rate of US $ 61.00 and the rates for libraries, reading rooms and other multiple use institutions are also available from AGU. There is a special annual rate of $ 31.00 AGU student members. Subscription rates and information on current issues may be found on the AGU homepage at http://www.agu.org and from the AGU office at *Radio Science*; 2000 Florida Ave, NW; Washington, D.C. 20009, USA. A recent Cover and Masthead of *Radio Science* is shown in Figure 4.

Since the goal of AGU is that each journal should be self-supporting, publication charges are assessed. For articles typeset by AGU the charge is $ 115 per printed page. AGU will typeset only those articles for which the AGU-typeset rate is paid. If the author provides final typewritten or typeset copy, prepared according to AGU specifications, the publication charge is $ 54 per printed page. Authors honoring publications charges receive 100 reprints. Owing to the rapid growth in the number of pages published in AGU journals, a new page charge policy has been established to reduce the average length of papers. Authors submitting papers to *Radio Science* will be charged an additional fee of $ 54 (author-prepared-copy) or $ 100 (AGU typeset copy) for each printed journal page after page 10. The surcharge will be billed in addition to current page charges and regardless of whether reprints are ordered. Complete instructions for authors are printed twice per year on the inside back cover of *Radio Science* - also available on the AGU homepage.

It is very important that authors submit their manuscripts to the *Radio Science* Editor-in-Chief at the AGU Washington, D.C. address and *not* to the Editor's local office, in order to facilitate timely handling of the manuscript.

Data and other material supplementing journal articles or data described in a printed summary may be made available through videotape, electronic mechanisms or microfiche. Examples include lengthy mathematical derivations, data tables, computer printouts, appendices or videotaped animations. Such material will be subjected to the same peer review procedures used for printed articles.



CONTENTS OF VOLUME 63D

Volume 63D—No. 1—July-August

Volume 63D—No. 2—September-October

III

Figure 2. Table of Contents of Vol. 63D, July-August and September-October 1959

Preface

Section D of the Journal of Research of the National Bureau of Standards will serve primarily as a medium for the reporting of research activities of the NBS Central Radio Propagation Laboratory relative to its mission of obtaining, analyzing, and disseminating information on the propagation of radio waves. In addition, the Bureau will solicit from time to time important papers in this field from research workers in other laboratories in order to provide a broad coverage of the advances in radio propagation science. Our plan to provide such coverage has been developed in consultation with the officers of the Institute of Radio Engineers and experts from outside NBS who have agreed to serve on an Editorial Advisory Board.

The Bureau's monthly publication, "Basic Radio Propagation Predictions," will continue to be issued separately.

JAMES R. WAIT, *Editor*,
Section D, Radio Propagation.

Figure 3. Preface for Vol. 63D by Dr. J.R. Wait

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It might be of interest - especially to authors - to briefly describe the "paper trail" of an article submitted to *Radio Science*....When the paper is received by the Editorial Assistant at the Washington, D.C. headquarters, it is immediately assigned a number and logged-in to the AGU manuscript-tracking system; then the cover letter, reviewers suggested by the author, abstract, introduction and selected other pages are faxed to the Editor-in-Chief , who sends an e-mail to the Editorial Assistant assigning the paper to an appropriate Associate Editor (or in some cases, declines the paper or suggests other journals to the author). The Editorial Assistant then sends copies of the paper to the Associate Editor and asks the Associate Editor to choose the reviewers. When the two reviewers are selected by the Associate Editor, the Editorial Assistant sends each a copy of the paper and maintains contact with the reviewer throughout the course of the review process. (This relieves the Associate Editor from the onerous task of "bugging the reviewers" !). Soon after the Associate Editor receives the reviews, he makes the decision to either recommend accepting, rejecting or asking the authors to revise the paper. The Associate Editor has an important role here - he can accept the reviews or seek another reviewer or act as a "tie-breaking" reviewer - then pass this information to the Editor via the Editorial Assistant. The Editor then makes the final decision on the paper and so informs the Editorial Assistant. If the paper is accepted, it then goes to the Production Department.

The AGU management is very concerned about "timeliness" - the prompt handling and disposition of the manuscripts submitted for publication on AGU journals - and continually strives to improve the timeliness statistics. The timeliness of this process depends, of course, on the responsiveness of the reviewers, the Associate Editors and the Editor-in-Chief - all of whom have omni-present pressures in their respective full-time jobs and all of whom are unpaid volunteers for *Radio Science* ! Another factor affecting timeliness is whether or not authors follow the instructions for authors printed inside the cover of

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1995–1998

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Radio Science welcomes original scientific contributions on all aspects of electromagnetic phenomena related to physical problems. The coverage embraces the propagation through and interaction of electromagnetic waves with geophysical media, biological media, plasmas, and man-made structures, and includes, but is not limited to, the application of electromagnetic techniques to remote sensing of the Earth and its environment, telecommunications, signals and systems, the ionosphere, and radio astronomy. All frequencies (including optical) are of interest.

To submit a paper, send five copies of the manuscript to Robert Hunsucker, c/o his assistant, Paul Cooper, AGU, 2000 Florida Ave., NW, Washington, D. C. 20009. Telephone: (202) 462-6910 X365, e-mail: pcooper@kosmos.agu.org

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The ultimate goal of the current Editorial staff of *Radio Science* is to strive to maintain the high ideals and standards set by past editors in soliciting and publishing the very best and most important papers in the field of electromagnetic research, both theoretical and applied. We continue the pursuit of excellence in our journal and strive for timeliness of publication of these papers.

In pursuing these goals, authors and editors would do well to ask - to paraphrase T.S.Eliot - "How from data, do we get information, how from information do we get knowledge and how from knowledge do we get wisdom ?"

The author was greatly saddened while writing this article to learn of the death of Professor James R. Wait, our founding Editor - who was a very close friend, colleague and mentor. His sage advise will be sorely missed.

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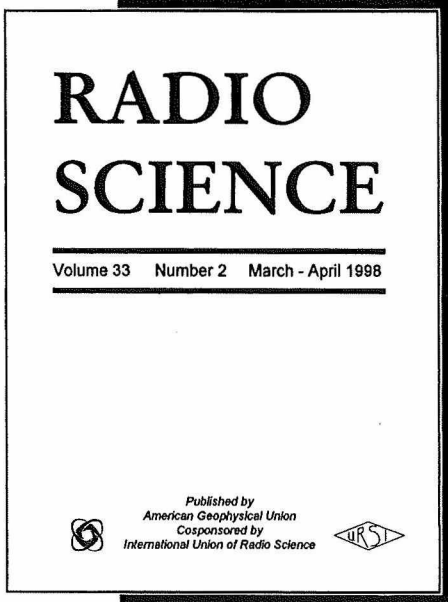

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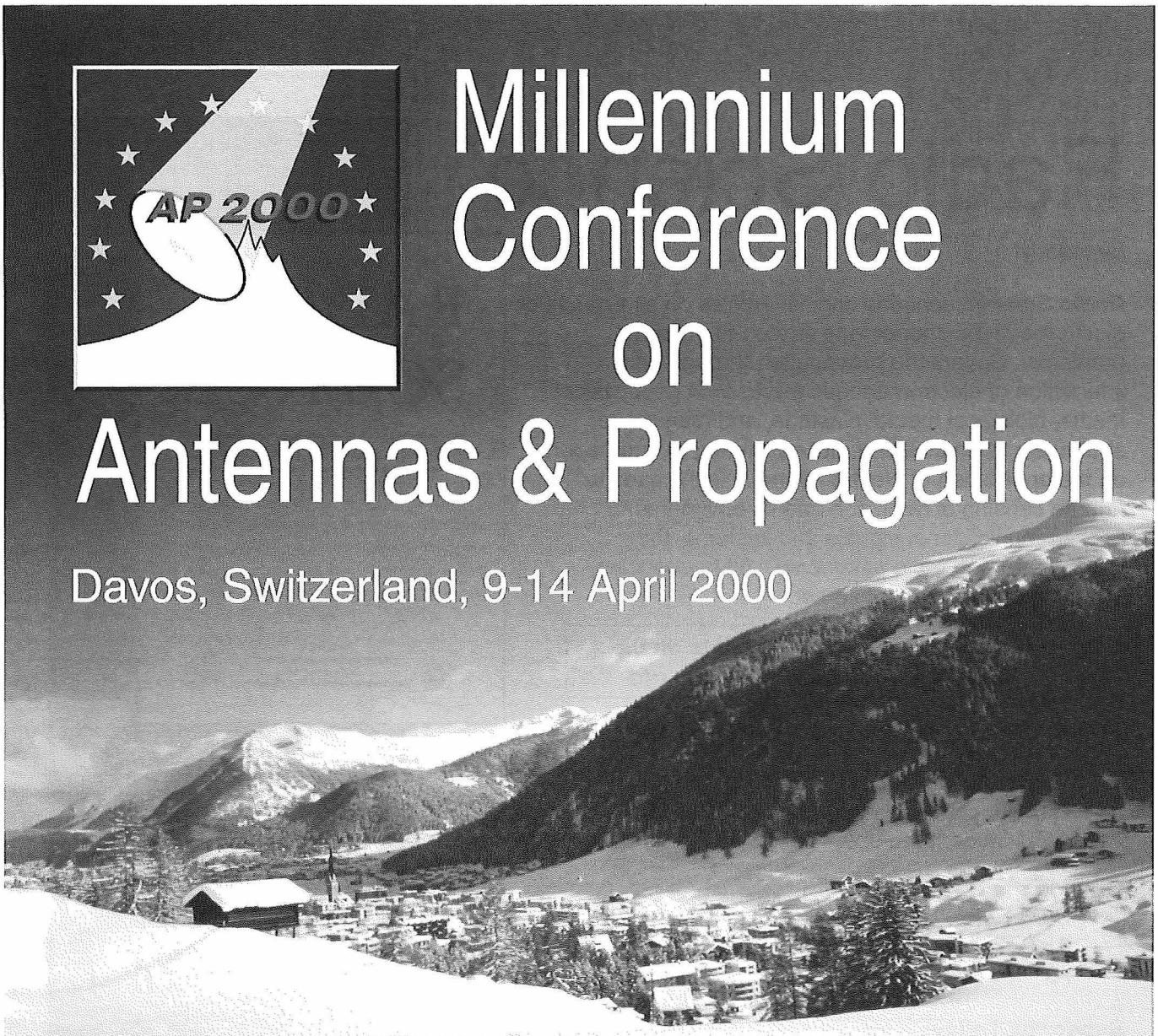

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G. D. Malyuzhinets : Notes On His Professional Activity and a Selected Bibliography

G. Manara et al.

The mathematical theory of diffraction of waves by wedge-type structures is a topic of remarkable importance for the analysis of a large class of problems, both in acoustics and electromagnetics, connected with radiation and scattering from complex targets, propagation over terrain and artificial environments, etc. Just one hundred years ago, in 1896, the German scientist Arnold Sommerfeld published a paper describing a rigorous solution for the diffraction of a plane electromagnetic wave from a perfectly conducting half-plane (A. Sommerfeld, "Mathematische Theorie der Diffraction," *Mathematische Annalen*, vol. 47, no. S319, pp. 317-374, 1896). For this contribution, he can be considered the founder of the rigorous mathematical theory of diffraction.

Since that milestone paper, a wide class of canonical wedge problems, at first related to the simplest forms of boundary conditions (Dirichlet and Neumann), was considered. Later on, the difficulty of generalising these solutions to more-complicated boundary conditions, able to account for the constitutive properties of the actual body material, came out. Methods based on the Wiener-Hopf technique are capable of providing elegant and efficient solutions to important canonical configurations. Unfortunately, these are fundamentally restricted to structures with rectangular geometries, such as half-planes and junctions at right angles.

Alternative mathematical techniques, namely the generalised reflection method and the method of Sommerfeld integrals, were proposed in the fifties by the Russian scientist, G. D. Malyuzhinets, to solve the canonical problem of scattering by an impedance wedge. Malyuzhinets provided an important contribution to the development of rigorous mathematical theories for the analysis of diffraction from more-general wedge configurations. Indeed, starting from his work, solutions have been devised for more-complicated canonical issues. These include, for instance, an impedance wedge illuminated by a plane wave at skew incidence, a wedge with boundary conditions containing higher-order spatial derivatives, a wedge with variable impedance faces, etc.

As with many other Soviet scientists, G. D. Malyuzhinets (or Maliuzhinets, or Maliughinetz) has been known in the western scientific community just for the translations from Russian of his most important papers. The aim of this communication is to provide a short biographical note, and a schematic overview of the scientific activity of this Soviet researcher, who was a student of Academicians V. A. Fock, M. A. Leontovich, N. N. Andreev, and I. M. Gel'fand. In particular, the detailed list of papers that has been reconstructed may be of interest to those researchers who are working on diffraction theory, an area of remarkable importance in applied acoustics and electromagnetics.

Professional Activity

The most important phases of Georgii Danilovich Malyuzhinets' (Moscow, July 2, 1910–Moscow, August 14, 1969) professional life are summarised in the following:
1929-1942 : Student, postgraduate student, Assistant Professor, and Associate Professor (Physics Department, Moscow State University, USSR)
1938 : Candidate of Science dissertation; Prize of the Central Committee of the All-Union Lenin Young Communist League for young scientists
1944-1950 : Research Collaborator and Research Fellow (P. N. Lebedev Physics Institute of the Academy of Sciences of the USSR)
1951 : Doctor of Science dissertation (P. N. Lebedev Physics Institute of the Academy of Sciences of the USSR)
1954-1969 : Senior Research Collaborator (P. N. Lebedev Physics Institute of the Academy Sciences of the USSR, Acoustics Institute of the Academy of Science of the USSR)

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1954-1960: Chairman of the Acoustics Department (Moscow Technical Physics Institute, USSR)
1960 : Professor in the Acoustics Department (Moscow Technical Physics Institute, USSR)
1962-1969 : Head of Mathematical Laboratory (Acoustics Institute of the Academy of Science of the USSR)

Selected Bibliography

The versatility of Malyuzhinets' talent is also demonstrated by the bibliography reported here, below. We attempted to compose an exhaustive list of all the papers published in technical journals and books. Conversely, only a selection of communications presented at conferences has been intentionally reported. Unless explicitly noted, papers in the bibliography are translated into English.

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Malyuzhinets' Contributions to the Theory of Diffraction

The scientific activity of Malyuzhinets concerned several fields in applied physics, but the most important part of his work was devoted to diffraction theory, both in acoustics and electromagnetics. Here, below, we report a short review of the results obtained by Malyuzhinets in applied wave theory and other related topics.

Theory and Design of Multi-layered Absorbing Acoustical Coatings

This work was stimulated by the ambitious project of constructing the Palace of Convents, in Moscow, the Big Hall cupola of which had to provide a noise absorption of 99%; see [P5] (the realisation of this project was interrupted by the beginning of World War II). For the engineering calculations of the laminated coatings, Malyuzhinets developed an original method.

Low-Frequency Theory of Acoustic and Electromagnetic Diffraction by Gratings and Perforated Screens

In the forties, Malyuzhinets developed a general approach to analysing the acoustical properties of bulk periodic gratings, by reducing the problem to the calculation of the associated hydrodynamic mass of its elements (see [P19]). This study, which provided the basic material for his Candidate of Science dissertation, won the prize of the All-Union Lenin Young Communist League for young scientists. Later on, this approach was used by Malyuzhinets in his paper on active noise control [P21].

General Mathematical Formulation of Diffraction Problems Based on the Extinction Principle

Malyuzhinets devised a new formulation of diffraction problems, based on the concept of the analytical dependence of the solution on the wave number. He showed that the "extinction principle" (the boundedness for complex k, corresponding to absorbing media) makes the solution unique for a wide class of infinite domains where the Sommerfeld radiation condition may not hold [P3-P6], [C8].

Generalisation of the Image Method, Wave Propagation on Riemann Manifolds

Malyuzhinets showed that the image (reflection) method can be extended to a wide class of domains, admitting analytical continuation of the wave field through some parts of their boundaries (as in the case of polygons or polyhedrons). He was probably the first to use virtual solutions of the Helmholtz equation on Riemann manifolds, and to construct and analyse wave fields in complex domains of the physical space (see [P2], [P15], [B1], [C10]).

Theory of Sommerfeld Integrals, Exact Solution to the Problem of Diffraction by an Impedance Wedge

Malyuzhinets investigated the analytical properties of the Sommerfeld integrals, and devised a standard way to construct the solution to the Helmholtz equation in wedge-shaped domains. His inversion formulas for the Sommerfeld integral, and the derivation of general functional equations

for the transform function, constitute very important tools for solving or analysing many diffraction and radiation problems [P7-P11, P14, P17, P20, P23, B2, C2-C5, C7].

Short-Wave Diffraction Theory Based on the Method of Transverse Diffusion (Parabolic Equation in Ray Co-ordinates)

This is probably Malyuzhinets' highest achievement in the physical theory of diffraction. In his pioneering work [C1], he gave a profound qualitative interpretation of the parabolic wave equation (proposed two years earlier, by M. A. Leontovich, and applied by Leontovich and V. A. Fock to the problem of radio-wave propagation along the Earth's surface) in terms of transverse diffusion of the slowly varying complex wave amplitude. He also proposed an important generalisation of this technique, combining the parabolic equation with the ray co-ordinates of geometrical optics. Independently of J. B. Keller, he came up with the concept of diffracted rays, and wrote the parabolic equation in evolutionary [P15] and radial [P16] co-ordinates, in order to describe the wave field's penetration into the shadow zone, or its scattering from a sharp edge. This analysis resulted in a consistent, short-wave diffraction theory [P13]. Moreover, Malyuzhinets realised that the parabolic equation arises as the leading term of an asymptotic expansion of the exact wave operator, in the short-wave limit [C10].

Introduction of Finite Difference Methods into Diffraction Theory; Numerical Simulation of Underwater Acoustic Propagation Using the Leontovich-Fock Parabolic Wave Equation.

Malyuzhinets was probably the first among scientists working in diffraction theory to realise the role of numerical methods and computer simulation in its future development. In particular, he pointed out that the "marching-on" nature and the absolute stability of the Leontovich-Fock parabolic equation made it adequate for step-by-step computing by means of finite-difference methods. A general algorithm of "numerical" transverse diffusion, along the joint GO and GTD wave fronts, and first applications to particular diffraction problems were reported in [C10]. Unfortunately, the first practical finite-difference code for underwater acoustics, implemented by E. A. Polyanskii, B. L. Egel'skii *et al.* under Malyuzhinets' supervision, in 1964, was published only in technical reports. The parabolic equation became widely used for numerical predictions of acoustical and radio propagation only after its rediscovery by F. D. Tappert, in the middle of the seventies.

Theory of Active Noise and Scattering Control (Acoustical "Fortunatus' Cap")

During the last years of his life, Malyuzhinets was fascinated by the problem of absolute acoustic insulation and "invisibility" (he referred to it as "Fortunatus' cap"). The idea of using active noise control to get rid of intrinsic radiation and spurious reflections had been discussed earlier. However, no one expected that the problem could be solved exactly for an arbitrary scattering object, no matter whether or not the direct diffraction problem admitted an explicit solution. Malyuzhinets brilliantly proved that the scattered and radiated components could be constructively selected from the measured total acoustic field, and compensated for by means of the corresponding "anti-radiation." He gave a general mathematical algorithm, based on his theorem on wave potentials [C9] (the analogue to the factorisation formulas in the theory of analytic functions), and showed methods for its practical implementation. An extended publication of these results appeared only after Malyuzhinets' death [P21], and was followed by a series of further works on the theory of active noise control.

CONFERENCE REPORTS

URPS'97

Tomsk, Russia, 2-4 September 1997

The International Urban Radiowave Propagation Symposium (URPS'97) was organized in Tomsk, Russia, September 2 through September 4, 1997 by Ministry of General and Professional Education of the Russian Federation, Tomsk State University of Control Systems and Radioelectronics (TUCSR), Tomsk State University (TSU) and Siberian Physical and Technical Institute (SPTI) with support and assistance of URSI Commission F, Russian Foundation for Basic Research (RFBR), Scientific Council on Complex Problem "Radiowave Propagation" of Russian Academy of Sciences, Ministry of Telecommunications of the Russian Federation, Tomsk Region Administration. The symposium was incorporated with the Second International Symposium "Application of the Conversion Research Results for International Cooperation" (SIBCONVERS'97).

More than 100 reports presented by various organizations of Siberian cities have been included in the Program. The Symposium topics have covered a wide circle of problems connected with the analysis of new approaches in the field of radiowaves propagation in the urban, radiolines for urban telecommunications, developments of double purpose in radioelectronics, instrument making, new materials properties researches, etc. General lock-and-key problems in realization of conversion of scientific researches and way of their decision in Siberian High Schools were also analyzed, the most perspective scientific directions, allowing to organize real international cooperation of the concerned parties are determined.

The Symposium marks that in Siberian Region and, specifically in Tomsk, a lot of double purpose and conversion R&D projects are actively performed by the high school researchers and related industry experts. In TUCSR, TSU and SPTI researches in the field of creation of radar systems for environment monitoring, radio-engineering systems are carried out, and television devices and devices of various economic purpose, fundamental researches in the field of radiowave propagation are performed; in Research Institute of Semiconductor Instruments, Tomsk State Pedagogical University the new instruments and technologies are developed.

The reports submitted on symposium have shown that potential of the high school science has a reasonably high level, though last years difficulties not get over yet. One of the main difficulties for High Schools of Siberia and Russian Far East is a great distance from science-consuming industry, destruction and high cost of communications. In these conditions, a patronage policy at all levels, from federal to local, is perfectly necessary for scientific researches in the High Schools.

The Symposium marks a positive role of the Scientific and Engineering Program "High Schools Technological Potential Conversion" of the Ministry of General and Professional Education of the Russian Federation.

The administration of the Tomsk Region announces the next competition among high schools, having of scientific researches directivity on regional use; the premiums of Tomsk Region outstanding scientifically- pedagogical collectives of high schools, separate scientist, post-graduate students and students are also awarded. However, the interaction of high schools with the region administration remains while insufficient and does not carry a system character. Conference calls to administration of the Siberia areas and, in particular, Coordinating Organs of the Siberian Agreement to consider the problem about mutually advantageous long-term cooperation to high schools and and financing their conversion developments, having created for this purpose necessary legal base and coordinating organs. It is necessary to generate also long-term program of such cooperation.

Usefulness and necessity of a conducted traditional meeting was noted. So The third International Symposium "Application of the Conversion Research Results for International Cooperation" will be held in Tomsk, Russian Federation, on May 18-20, 1999. This time the joint-stock company "TomskTelecom" has agreed to provide the financial assistance for meeting, and the IEEE will be a technical sponsor.

SIBCONVERS'99 Symposium will provide an international tribune for information exchange on conversion of the military or double purpose scientific researches and investigations for using in peaceful purposes. Participation of the Siberian Institutions of Higher Education having a large experience in defense research (Tomsk, Novosibirsk, Krasnoyarsk, Omsk, Irkutsk, Barnaul and others) and also Russian representatives of military-industrial complex is planned.

The Symposium Topics were :

- radiowave propagation problems;
- problems in designing of radioengineering devices and control systems;
- designing and manufacturing of electron devices and Microwave/RF components;
- mathematical simulation and modeling in high-tech field;
- theory and methodology of information systems and telecommunications;
- advanced technologies.

Interested authors for SIBCONVERS'99 may contact Prof. G.S. Sharygin, Dr. O.V. Stoukatch, TUCSR, 40 Lenin Ave., Tomsk, 634050, Russia. Phone: +7-3822-233183, Fax: +7-3822-526969, E-mail: office@tusur.ru.

We thank the Russian Foundation for Basic Research for the essential contribution to the realization of URPS'97, as well as the foreign participants of Scientific Program Committee and especially the Commission F of URSI for the assistance in the realization of the meeting. We highly appreciate the URSI Commission F and we hope for continuation of fruitful cooperation.

EUSAR'98

Friedrichshafen, Germany, 25-27 May 1998

The EUSAR conference (European Conference on Synthetic Aperture Radar) was initialized in 1996 by FGAN (German Defence Research Establishment) and DLR (German Aerospace Research Centre) and is planned to be held every two years. This conference is devoted to SAR technology and techniques. With this scope EUSAR is unique in the world. Originally SAR used to be a special discipline of the traditional radar conferences. In the meantime SAR has become an independent topic which needs its own conference. EUSAR fills the gap between the traditional radar conferences and the application oriented remote sensing events.

The geometrical resolution capability of a radar is limited by the size of the antenna aperture. High resolution images (with image quality comparable to photography) can be obtained by the synthetic aperture principle: A single radar sensor flies along a straight path (using an aircraft, space shuttle or satellite), the echoes are stored and processed as if they were received simultaneously by an array antenna. Contrary to optical systems radar can penetrate weather, dust and smoke, and can operate during day and night.

EUSAR'98 was held in the Graf-Zeppelinhaus in Friedrichshafen, Germany. It has been organised by Dornier Satellite Systems, DLR, FGAN, and VDE and has been co-sponsored by URSI, EUREL, IEEE and DGON.

There are various applications for SAR (Synthetic Aperture Radar) imaging, such as :

- Imaging of the earth surface (geography, geology, geodesy, oceanography)
- Environmental monitoring (polar ice, oil spills, deforestation/regrowth of vegetation)
- Agriculture (snow and humidity maps, classification of vegetation, harvest monitoring)
- Disaster monitoring (flood, landslides, tropical storms, assessment of damages)
- Geophysics (earthquakes, vulcanic activities)
- Military (surveillance. reconnaissance, classification)

EUSAR'98 was opened by Prof. Kröll, president of DLR. He illustrated the use of SAR for various applications. He claimed that in the near future SAR has to leave the experimental stage and has to enter the status of an economic tool financed by customers.

The EUSAR'98 program was dominated by two themes: "SAR Systems" and "Interferometry". Several approaches towards small and cheap SAR systems were reported. The SRTM experiment (space shuttle with a 60 m boom for the interferometric antenna) will play an important role in 3D earth monitoring. By SAR interferometry digital elevation maps (DEM) can be genarated and exploited, for instance for monitoring of vulcanic activities and moving events on the earth surface (currents, polar ice).

The number of participants amounted to 260, coming from 25 countries from all 5 continents. 160 papers (2 oral sessions and posters) were presented. The papers are published in the conference proceedings (ISBN 3-8007-2359-X) which can be purchased through: VDE Verlag, Bismarckstr. 33, D-10625 Berlin, Germany.

The next EUSAR conference will be held on 22-24 May, 2000, in Munich, Germany. Chairman will be Dr. W. Keydel, DLR.

R. Klemm
EUSAR Vice-Chairman

DAY ON DIFFRACTION '98

St.Petersburg, Russia, 2-4 June 1998

Day on Diffraction was organised by the Faculty of Physics, St.Petersburg Univ.; the St.Petersburg Branch of Steklov Mathematical Inst. and the Euler International Mathematical Institute and was co-sponsored by the Russian Foundation for Basis Researches, IEEE ED/MTT/AP St.Petersburg Chapter and URSI.

The number of participants totalled 60; with 12 young scientists and 2 students. The following countries were represented: China, France, Germany, Norway, Russia, Turkey, Ukraine, U.K., U.S.A.

The scope of the annual International Seminar "DAY on DIFFRACTION" is to bring together scientists working in the area of mathematical theory of wave diffraction and propagation and researchers interested in application of various nature wave phenomena, with an emphasis on the application of new ideas and recent achievements of mathematics and mathematical physics to the practically important problems. The establishment and development of personal contacts between scientists from Russia and CIS and leading Western experts is also the essential goal of the meeting.

The organized sections were as follows:

1. Asymptotic technique for the problems of electromagnetic wave diffraction and propagation (3 sessions).
2. Asymptotic approach to the spectral problems.
3. Exact solutions of nonlinear integrable equations.
4. Propagation of elastic waves and seismic problems (2 sessions).
5. Wedge and cone diffraction.
6. Non-stationary problems.
7. Internal and surface waves in the fluid (2 sessions).

There were no invited speakers. The Seminar was attended both by "rigorous" mathematicians: D.J.Gilbert (U.K.), S.Yu.Dobrokhotov (Russia), V.M.Babich (Russia), A.M.Samsonov (Russia) and leading experts in application fields: J.Ockendon (U.K.), T.M.Zaboronkova (Russia), V.V.Borisov (Russia), B.Ursin (Norway), P.G.Malischewsky (Germany), M.A.Meadows (U.S.A.), N.W.M.Ko (Hong Kong). Participation of these famous scientists provided the atmosphere of high-level forum by which all other participants had enjoyed. The time-table of the Seminar left sufficient time for informal discussions and contacts.

Social activity was limited by short duration of the event and extensive scientific program. However, an excursion to the world known Petrodvoretz' Palace and Garden was conducted.The organization of the "DAY on DIFFRACTION'98" Seminar met the approval of all participants.

MMET'98

Kharkov, Ukraine, 2-5 June 1998

MMET*98, which stands for "Mathematical Methods in Electromagnetic Theory", was held at the Kharkov State University in Kharkov, Ukraine on 2-7 June 1998.

Working days of th-e conference were June 2 to 5; June 1 was the day of registration, weekend of June 6 and 7 was filled with social events. Every day the conference started with a plenary session of three 40-min invited lectures at a large auditorium. After it, four parallel day-long sessions of 20-min contributed papers had been working. All the papers were presented in English. The number of registered participants was 201 including 23 from the Former Soviet Union, and 45 from Ukraine; it is estimated that up to 50 more participants, mainly from Kharkov, did not register. Totally 225 papers out of 272 in the Program were presented. 51 presenters were supported in the amount of return train ticket expenses. Two-volume MMET*98 Proceedings totaling over 900 pages were published before the conference. The holding of the conference became possible thanks to the support of sponsors. The next MMET meeting is planned to be held in Kharkov in 2000.

MMET*98 started at 8:20 on June 2, 1998 by the opening ceremony at the New Physical auditorium of the Kharkov State University. First to address the participants was MMET*98 Chairman, Prof. Eldar Veliev of the Institute of Radiophysics and Electronics of the National Academy of Sciences of Ukraine (IRE NASU). He remarked that MMET conferences have already 10 year history and have gained a high reputation and recognition in the Former Soviet Union (FSU) and worldwide. He was followed by the welcome words from Dr. Petr Melezhik, vice-director of IRE NASU, on behalf of the National Academy of Sciences of Ukraine. Dr. Melezhik emphasized the strong academic traditions of IRE in electromagnetic theory. The next to make a welcoming speech was Prof. Oleg Tretyakov of the Radiophysics Department of the Kharkov State University (KSU). He greeted the audience as the chairman of the Commission "B" (Fields and Waves) of the Ukrainian National URSI Committee. He reminded that Kharkov State University is a hub of electromagnetics and applied mathematics in Ukraine and FSU, and presented the greetings of KSU Rector, Prof. Vasilii Svich, who was away at a meeting out of Ukraine. Eventually, Prof. Alexander Nosich of IRE NASU addressed the participants on behalf of the IEEE East Ukraine Joint Chapter of the Antennas & Propagation, Microwave Theory & Techniques,

Electron Devices, and Aerospace & Electronic Systems Societies. This chapter, founded in 1995, is the primary sponsor and organizer of MMET*98. On the same morning the first plenary session was held, consisting of three invited talks: - K. P. Gaikovich (R&D Institute of Radio Physics, Nizhny Novgorod, Russia), Ill-posed inverse problems based on Volterra-type equations, - R.L. Dowden, et al (University of Otago, Dunedin, New Zealand), Remote sensing by VLF using "Absolute Omnipal": investigation of short-path propagation for possible earthquake precursor prediction, - M. Lenoir (ENSTA, Palaiseau, France), Regularization of Maxwell equations, corner singularities and numerical approximation. Further, after a coffee break, the conference continued working with four simultaneous sessions: - Inverse and Synthesis Problems (19 papers), - Gratings and Frequency-Selective Surfaces (16 papers), - Electromagnetic Theory (17 papers), - Ionospheric Electromagnetics (15 papers). In the latter session, invited paper of L. N. Litvinenko and Y. M. Yampolski (Inst. Radio Astronomy NASU), Ukrainian radio physical system for seismo-ionospheric monitoring, was presented, after the request of absent authors, by G. Milinevsky of Kiev University. He also presented his own upper atmosphere research results at the Ukrainian "Vernadsky" Antarctic Polar Station. By agreement with the organizers, two other papers that came too late to be included into the program were presented: one by Y. Rappoport from Kiev University, and the other by V. Taran, et al., from the Inst. of Ionosphere of NASU, Kharkov, both on ionospheric electromagnetics. The same evening, at 7:30 p.m., a Welcome Party was organized at the university cafeteria. Before it started, MMET*98 participants were invited for a short visit to the roof out-looking space on top of the 18-level main tower of the university building. The June weather was fine and allowed enjoying aerial views of the 2-million city, full of green trees and busy streets. At the welcome party, Ukrainian champagne was served. This event created a perfect atmosphere to relax and shake off the troubles of the long journeys that participants had to undertake to reach MMET*98. At the conference morning plenary session, the following invited papers were presented: - N. Engheta (University of Pennsylvania, Philadelphia, USA), Fractional calculus and fractional paradigm in electromagnetic theory, - N. P. Yashina (IRE NASU, Kharkov, Ukraine), Time-domain electromagnetics of waveguide-type open resonators, - D. P. Nyquist (Michigan State University, East Lansing, USA), Radiation field of asymmetric planar dielectric waveguide. This day regular sessions of contributed papers consisted of: - Time Domain Electromagnetics (18 papers), - Waveguide Circuits (19 papers), - Electromagnetic Signal Processing (17 papers), - Scattering and Radar Cross Sections (18 papers). A number of no-shows was reported by the session chairpersons, mainly of the authors from distant regions of Russia, and also from Bulgaria and Poland. However, a large number of papers were presented by the colleagues of the absent authors, including the paper of P.-M. Cutzah of ENSTA, Palaiseau, France presented by M. Lenoir. On this day, a bus city tour was organized, enabling participants to get acquainted with the history of Kharkov, second-largest Ukrainian city. Remarkable historical buildings and monuments, such as Assumption Cathedral, WW II Memorial, Gosprom complex built in the 20's as an example of constructivism style in the architecture of early Soviet period were visited. On the third day of the conference, the plenary session experienced a "perturbation" due to the absence of K. Shifrin of the Oregon State University, Corvallis, USA. Dr. S. V. Sukhinin had kindly agreed to the proposition of organizers and filled this gap with his additional tutorial paper. So, that day morning session looked as follows: - T. Jablonski (Institute of Fundamental Technological Research of the Polish Academy of Sciences, Warsaw, Poland), An efficient iterative scheme for solving eigen problems in the theory of electromagnetic waves, - S. V. Sukhinin (Institute of Hydrodynamics of the Russian Academy of Sciences, Novosibirsk, Russia), Topological methods in wave diffraction theory, - P. D. Smith (University of Dundee, Dundee, Scotland), Time-domain solvers versus analytical regularization in integral-equation analysis of canonical scatterers. Parallel sessions of regular papers that day went along the following topics: - Antennas and Arrays (16 papers), - Computational Techniques (17 papers), - Complex Media (18 papers), - Analytical Regularizations (17 papers). At the latter session, a special jury was present, whose task was to evaluate possible candidate papers for a newly introduced V.G. Sologub Award of MMET "For remarkable contribution to the development of analytical regularization techniques in electromagnetics". Vladimir G. Sologub passed away in 1986. He was a scientist working in Kharkov, applied mathematician by education, who made a major contribution into the understanding of the role of analytical regularization approach and developed several benchmark solutions to canonical problems in the wave scattering theory. The most famous of them consists in two second-kind integral equations with overlapping low-frequency and high-frequency domains of convergence of the Neumann series analytical solutions, in the flat strip scattering. On the same evening, the conference banquet was held at the university cafeteria. This was a lovely event accompanied with live music, dancing and speeches. The dominant tone, however, was the joy of meeting the old friends and colleagues and making new ones. On the last working day of the conference, the morning plenary session consisted of two invited papers: - M. Marciniak (Institute of Telecommunications, Warsaw, Poland), Beam propagation method modeling of light propagation in optical waveguides, - E. Michielssen, et al., (University of Illinois, Urbana-Champaign, USA), Recent developments in fast-multipole based frequency and time domain solvers. Parallel sessions of that day covered the topical areas as: - Open Waveguides (12 papers), - Eigen value Problems (13 papers), - Random Media and Rough Surfaces (14 papers), - Lasers and Optical Fibers (11 papers). In the first two of them, two more invited papers were presented: - S. V. Sukhinin (Institute of Hydrodynamics of RAS, Novosibirsk, Russia), Waveguiding and anomalous properties of a knife-type periodic strip grating, - A. I. Nosich (IRE NASU, Kharkov, Ukraine), The cost of pleasure: about some catastrophes in

time-harmonic wave scattering. The closing ceremony of MMET*98 took place in the New Physical auditorium of KSU at 5:30 p.m. At first, several awards of the conference were announced and handed to the awardees. The V.G. Sologub Award "For remarkable contribution to the development of analytical regularization techniques in electromagnetics" went to D. Kuryliak, K. Kobayashi, Z. Nazarchuk and S. Koshikawa (Lviv, Ukraine and Tokyo, Japan), for the paper entitled, Wiener-Hopf analysis of axial symmetric diffraction problems for open-ended cylindrical waveguide cavities. Six traditional MMET awards "In recognition of the best presentation at the student paper contest" went to the following young scientists: - Georgy Bit-Babik of Tbilisi State University, Georgia (1-st grade), - Maria Tchernyaeva of Nizhny Novgorod State University, Russia (2-nd grade), - Daria Kondratenko of Novosibirsk State University, Russia (2-nd grade), - Fatih Dikmen of Gebze Institute of Technology, Turkey (3-rd grade), - Dmitry Churmakov of Inst. of Nuclear Problems, Minsk, Belarus (3-rd grade), - Mikhail Gilman of the Inst. of Problems in Mechanics of RAS, Moscow, Russia (3-rd grade). Beside this, three original honorary certificates were handed "For the most distant travel to MMET*98 and remarkable paper presentation", to: - I. B. Yumov of East-Siberian Technical University, Ulan-Ude, Buryatia, Russia, - M. V. Tinin of Irkutsk State University, Russia, - R.L. Dowden of University of Otago, Dunedin, New Zealand. Each MMET award consisted of a colorful certificate signed by the chairman and a bottle of Crimean champagne. Final closing address was done by Prof. Eldar Veliev. He informed the audience that, in all, the number of registered participants was 201 that was much greater than at any previous event of this series. Unidentified number of non-registered participants was estimated as around 50, mainly from Kharkov universities and research establishments. Of registered participants, 23 came from the non-FSU countries, and 45 others from the cities of FSU other than Kharkov. Of 272 papers included into the Program of MMET*98, 225 had been presented according to the preliminary information. Relatively high fraction of no-shows is understandable as travel budgets of universities and laboratories are today zero in FSU. In fact, a great number, 51 in all, of non-Kharkov speakers were able to attend the conference due to a partial or complete support of the train-travel expenses from the organizers. This was especially important for the students and young scientists who obtained their first experience of taking part in a major international conference and presenting their research results in English. One should note that such a support, as well as publishing the Program and the 900-page Proceedings, and holding such a conference in general would not be possible without a generous support of MMET*98 sponsors: INTAS, IAGA, IEEE, EOARD and ONREUR. After that, Prof. R.L. Dowden thanked the organizers for creating an unprecedented forum for scientific discussions and expressed a hope that MMET series will continue. He confirmed his intention to write a report of the MMET*98 for the IEEE Antennas & Propagation, of which he is an associated editor. Eldar Veliev announced that the next conference, MMET*2000, will be held most probably again in Kharkov, although a proposal had been received to hold it in Gebze, Turkey. On the weekend after the conference, the participants were proposed a dense social program in order to get relaxed after four days of intensive work and strengthen the links originated at the conference. On Saturday, June 6, an outdoor barbecue party was organized in a park zone at the northern rim of the city. Besides of shish-kebab roasted at the field fire and drinks, participants enjoyed playing volleyball and badminton, riding on a horse, and competing in a football game 'Europe versus Asia' at an improvised field. A bus transportation to the place of barbecue and back was provided. On the next day, Sunday June 7, a full-day bus tour was organized from Kharkov to a natural and historical reserve Holy Hills located some 160 km to the South-East, on the banks of the Seversky Donets River. The road passed small cities of Kharkov region: Chuguev, the birthplace of Russian artist Ilia Repin, and Izyum, both located at the Donets River. Holy Hills is a 600 years old cluster of caves and churches in and on top of a 200 m high limestone hill covered with oak forest. Before being closed in 1922, the monastery here counted over 500 monks. In Soviet period, it was turned into a recreation center of the Donbass coal mine workers. Recently the churches and some of the buildings of the monastery have been given back to the monks, 75 of whom live now here; the churches are being renewed and decorated. The view from the observation place on the hilltop was fascinating, showing a twisting curve of the Donets that follows the chain of limestone hills and vast green forested space under a blue summer sky.

Oleg A. Tretyakov and Alexander I. Nosich

COSPAR Scientific Assembly'98

Nagoya, Japan, 12-19 July 1998

Session C4.1 Lower Ionosphere: Measurements and Models

This session was organized by the COSPAR/URSI interunion Working Group on the International Reference Ionosphere (IRI) and was held on the first three days of the 32nd COSPAR Scientific Assembly at the Congress Center in Nagoya, Japan. This session was co-sponsored by the International Union of Radioscience (URSI). The main topic of this year's IRI session was the Lower Ionosphere (the D and E region; altitude range from about 50 to 150 km). A total of 46 papers were presented during this session including 17 invited, 12 contributed, and 17 poster contributions. The different IRI half-day sessions dealt with the following topics: D Region Modelling 1 and 2, D

Region Data, IRI Improvements - Middle Ionosphere, New Models and Data for IRI 1 and 2, Lower Ionosphere - Data, Ion Composition, and Posters.

Lower Ionosphere

The first day provided a good overview over the different ongoing modelling efforts that could benefit an improved IRI model in this region. The next version of IRI will include results from two of these efforts as new options for the electron density in the D-region: (1) the neutral density dependent model of Friedrich et al. (Graz, Austria) based on a large number of rocket measurements that now also includes a high-latitude part; and (2) the model of Danilov et al. (Moscow, Russia) that includes representative profiles for conditions of winter anomaly and of stratospheric warming. Discrepancies still exist between these different models primarily because of the relative data sarcity in this region that is difficult to reach by satellite insitu instruments as well as direct measurements from the ground. Including the two options in addition to the current IRI model will hopefully stimulate comparisons with more data and eventually help to select the best model.

Results from theoretical models as presented by Kopp (Bern, Switzerland) and by Turunen (Sodankylae, Finland) are important to bridge the data gaps and study global, seasonal and solar cycle trends. Theoretical models are also an excellent tool for exploring the role of various chemical reactions and neutral constituents, e.g. the role of the minor constituent nitric oxide. Kopp finds that switching from the NCAR model to the UARS/HALOE model for NO results in an oder of magnitude difference in the resulting electron density.

MF differential absorption measurements obtained by ground radar (Igarashi et al., Japan) and during a rocket flight (Nagano and Okada, Japan) as well as Omega navigation signals from the Akebono satellite (Miyamura et al., Japan) were used to deduce D region electron density. Comparisons with IRI highlighted the strength and weakness of the current IRI model.

The E-peak is, of course, a very important point for lower ionosphere modeling since it is generally the point of highest ionization in this region. Presentations during this workshop compared peak data obtained by ionosonde (Mosert, Argentina) and by incoherent scatter radar (Pandey, India) with the IRI predictions. Good agreement was in general found for the peak density and improvements were suggested for the description of the diurnal variation of the peak height hmE. Based on the excellent predictability of peak densities Nusinov et al. (Russia) recommend using the long record of E peak ionosonde observations and a simple model to deduce the solar cycle variation of solar EUV and soft X-ray fluxes.

The prime data source for the lower ionosphere are rocket and ground (ionosonde, radar) measurements. Gupta (India) and Chakrabarty (India) reminded the group that a considerable amount of low-latitude D and E region electron density data are available from rockets launched from Thumba over the last decades. A data base of ion composition data obtained by rockets was presented by Grebowsky and Bilitza (USA) comprising of all available published sounding rocket observations. EISCAT incoherent scatter data were used by a number of presenters. Fujii (Japan) used the many parameters that can be deduced from the EISCAT measurements to study the energy coupling between the ionosphere thermosphere and magentosphere. Shibata et al (Japan) and Kofman et al. (France) deduced the ion composition from the EISCAT data and investigated the variation of the transition height from oxygen ions to molecular ions. Their model will be helpful in the redesign of the IRI ion composition model which will be based on the transition heights as the characteristic points.

Middle Ionosphere

Great progress has been made in improving the accuracy of the IRI electron density predictions from the F peak down to the top of the E-valley. A special IRI Task Force Activity organized by Radicella (Italy/Argentina) at the International Center for Theoretical Physics (ICTP) in Trieste, Italy has produced a number of new model inputs. Bilitza et al. (USA) presented the results pertaining to the bottomside thickness and shape parameters B0 and B1. New ionosonde data especially from low and equatorial latitudes have led to improvements of the IRI model of in some cases more than 30%. During this meeting new results for B0 and B1 were presented based on parameters deduced from incoherent scatter measurements from Arecibo (Sethi and Mahajan, India) and from the Japanese MU radar (Zhang et al., China/Japan). Reinisch (USA) presented another result of the task force effort, a better scheme for connecting the bottomside to the valley top avoiding some of the pitfalls of the approach that is currently used in IRI.

Fuller-Rowell et al. (USA) are continuing their efforts to develop an empirical model for the F-region strom-time changes in electron density. He reported good success in describing the negative storm phase and to a lesser extent for the positive phase. His model is now scheduled to be included with the next version of IRI. Watanabe et al. (Japan) studied the low-latitude response to magnetic disturbances using Hinotori satellite data and the Fejer&Scherliess disturbance plasma drift model. It was again noted that IRI should include a plasma drift model and that the Fejer&Scherliess model would be the best candidate.

Single-station models and tests were presented based on ionosonde data from Istambul (Ozguc and Tulunay, Turkey) and from Warsaw (Stanislawska, Poland).

Theoretical models were combined with ground-based data (Balan, Brazil and Fukao, Japan) and with satellite data (Su and Bailey, U.K., and Oyama, Japan) to investigate annual and seasonal variations of ionospheric parameters. Variation of the equinoctial assymetry with altitude and of the winter summer difference could be partly explained by the variations of neutral composition and winds. Ionosonde data from Fortaleza and Cachoeira Paulista (both in Brazil) were compared with the results from the Sheffield model to determine the equatorial vertical plasma drift and the thermospheric merdional wind (Souza and Abdu, Brazil, and Bailey, U.K.).

Topside

Data from the Intercosmos satellites IK 19, IK 24 and IK 25 were used to construct empirical models of electron density and temperature highlighting the discrepancies to IRI (Truhlik et al. Czech Republic). The same team also established model descriptions for the ion composition measurements made by the IK 24 ion mass spectrometer from 1989 to 1991. Iwamoto et al. (Japan) did a statistical analysis of ion mass spectrometer data from ISS-b (1978-1981) and Akebono (1989-present) and discussed the solar cycle correlation of the different ion densities and implications for IRI.

All of these empirical models are an important new source for improvements of the IRI model in the topside. Shortcomings of the present IRI topside model were noted in comparisons with Hinotori data (Ezquer, Argentina) and with ISIS sounder data (Bilitza, USA).

IRI Group Specifics

Several new members were accepted into the IRI Working Group: Peter Dyson, LaTrobe University, Melbourne, Australia; Iwona Stanislawska, Space Research Center, Warsaw, Poland, and Tim Fuller-Rowell, SEC, NOAA, Boulder, Colorado. Accepting an invitation by Bodo Reinisch (UML) the Working Group decided to hold the 1999 IRI Workshop at the University of Massachusetts in Lowell. The date was set to August 9 to 12 which is the time period between the Digisonde Seminar at UML and the URSI General Assembly in Toronto, Canada (13-21 August 1999). The Workshop topic will be quantitative descriptions of ionospheric variability and analytical models for ray tracing. Selected papers of the 1996 IRI COSPAR session are now published in Advances in Space Research, Volume 20, Number 9. The final set of papers from the 1997 IRI Workshop was submitted to Advances in Space Research in April and publication is expected soon.

Dieter Bilitza

5TH INTERNATIONAL SUZDAL URSI SYMPOSIUM

Moscow, Russia, 26-29 August 1998

The 5th International Suzdal URSI Symposium on the Modification of the Ionosphere (ISSMI'98) was held at IZMIRAN in Moscow from 26 to 29 August 1998. The Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation of the Russian Academy of Science (IZMIRAN) and the Russian National Committee of the International Union of Radio Science (RNC-URSI) organised the Symposium, and IZMIRAN and URSI sponsored it.

Prof. V.V. Migulin chaired the meeting, and the Vice-chairmen were Prof. A.V. Gurevich and Prof. V.N. Oraevsky. Prof. S.A. Pulinets was the chairman of the Local Organising Committee. Sixty participants represented the following countries: Germany, Finland, Norway, Russia, Sweden, Ukraine, and the USA. The Symposium Programme included the following topics:

- Powerful HF radio wave interaction with the ionospheric plasma:
- ELF-VLF waves excitation in the ionosphere and magnetosphere.
- Action of powerful microwave emission and particle injections on the Earth's atmosphere.
- Modification of the ionosphere by electrostatic atmospheric electric field.

In total, 27 invited reports, 21 oral papers and 30 posters were presented. A list of the presented papers is available on the Web address at the following URL : http:\\www.ISSMI98.izmiran.troitsk.ru.

The Book of Abstracts of the meeting has been prepared, and the invited papers will be published in the December 1998 issue of the Journal "Radiophysics and Quantum Physics". The abstracts are available in electronic form; requests should be sent to ISSMI98@izmiran.rssi.ru. For financial reasons, there will be no hardcopies printed.

Prof. V.M. Cmyrev initiated a Memorandum to the Russian President about the prolongation of the space orbital station MIR's lifetime to continue active ionospheric modification experiments and investigations.

The social activities included an excursion to Moscow and a welcome party organized by Prof. V. N. Oraevsky, the Director of IZMIRAN.

The participants agreed that the 6th Suzdal Symposium be held in Finland in August 2001.

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ELECTROMAGNETIC FIELDS IN BIOLOGICAL SYSTEMS

Prague, Czech Republic, 13-16 September 1998

Symposium "Electromagnetic Fields in Biological systems" (September 13—16, 1998, Prague, Czech Republic) was organized by the Institute of Physiology, 1st Medical Faculty (under the aegis of the dean of the faculty, Professor P. Hach), by the Institute of Radio Engineering and Electronics and the Institute of Computer Science (Academy of Sciences of Czech Republic), by the Faculty of Electrical Engineering, Czech Technical University in Prague, by the National Institute of Public Health, and by the Institute of Radiation Oncology in commemoration of the 650th anniversary of foundation of Charles University. The Symposium was sponsored by the Commission K of URSI, and was organized under the auspices of the joint URSI Committee of the Czech and the Slovak Republic and was linked with the Czech participation in the European COST 244bis project. Scientists from 14 countries (Belarus, England, Germany, Hungary, Italy, Japan, Jugoslavia, Romania, Russia, the Slovak Republic, Sweden, Ukraine, USA, and the Czech Republic) participated and presented 32 papers.

Biophysical theories included control of long-range donor-acceptor tunnel electron transfer by a periodic electric field, for instance in photosynthetic reaction center and in mitochodrion membrane (E. G. Petrov), multivibron soliton relaxation on lattice vibrations in molecular chains (S. Zekovi), effects of endogenous electromagnetic field on the dynamics of DNA chain breather like excitations (M. V. Satari), and significance of van der Waals interaction for selfreparation of DNA after a double mutation (A. O. Pinchuk). Analyses of the Fr^hlich coherent states (T.-M. Wu), of their feedback relationships and condition of stability and of coherence (F. robr, J. Pokorny), and of the ground state energy of the Wu-Austin Hamiltonian (H. Bolterauer) were presented.

Statistical theory of dynamic instability of microtubules (assembly and disassembly) enables evaluation of the amount of energy transferred into the microtubule structure in the cells (H. Bolterauer). Ferroelectric model of microtubule dynamics was used to explain energy transfer without dissipation due to coherent modes (N. E. Mavromatos). Microtubules and actin filaments satisfy conditions for excitation of coherent states (J. Pokorny). The time course of the electromagnetic field generated by the synchonized culture of yeast cells (a tubulin mutant of {\it Saccharomyces cerevisiae) in the M-phase was compared with the development of their mitotic spindle and the measurement technique was described (F. Jelnek). Conformation states of NH$_3$ molecules and their possible role in amino acids were presented (V. Trkal). Common model of evolution of living cells and central nervous system was presented too (V. L. Vvedenski).

Nonthermal effects of electromagnetic fields in connection with coherent excitations of cells were discussed (G. J. Hyland). Experimental data on electro\-stimulation of cells by a weak electromagnetic field show that intensity, frequency and time windows exist (H. Berg). Poor replicabilty of mm waves nothermal bioeffects was discussed in terms of transition from the endergonic to exergonic processes (Yu. P. Chukova). Dependence of nonthermal effects of electromagnetic fields on density of the cells suggests involvement of electromagnetic interaction between them (I. Ya. Belyaev). Lens modification was observed as one of the ocular effects in radar workers (S. Miclaus). Extracorporal exposition of blood to magnetic field may be used for medical treatment of arteriosclerosis (V. A. Ostapenko). Electric methods are used to assess the effects of interaction of local anaesthetics with planar bilayer lipid membranes (M. Fajkus).

New applicators for deep and regional electromagnetic hyperthermia and intracavity applicators (J. Vrba, O. Volevs), microelectronic sensors for measurement of blood gases concentration and blood acidity (R. Vit), and microelectronic sensors for measurement of cell generated electromagnetic field (B. Palan) were described.

In the Opening Session in the Small Ceremonial Hall in the ancient 14th century building of Charles University, Carolinum, the official representatives of Charles University, of Czech Technical University in Prague, and of Academy of Sciences of Czech Republic emphasized that since the foundation of Charles University in 1348 Prague was an important center of education, culture, and science.

ISSSE '98

Pisa, Italy, 29 September - 2 October 1998

As the wireless technology becomes increasingly more pervasive to our lives, International Symposium on Signals, Systems and Electronics (ISSSE) becomes one of the most important meetings for URSI that is emphasizing the telecommunication. ISSSE series has been organized by Commissions C (Signals and Systems) and D (Electronics and Photonics). The first meeting was held in Erlangen, Germany in 1989, which was followed by Paris in 1992 and San Francisco in 1995. At Lille General Assembly, Commissions C and D formed the ISSSE Steering Committee to maintain continuity and to enhance visibility for the future ISSSE series as well as to assist organizers. One of the recommendations by this Steering Committee is that the meeting be held in close proximity (in time and

space) of a major meeting of interest to either Commission. Another recommendation is to select a well-meaning theme to the meeting, rather than collection of papers.

ISSSE '98 was held on 29 September - 2 October, 1998 at Palazzo dei Congressi in Pisa, Italy. The dates fall in the week prior to the European Microwave Conference in Amsterdam to satisfy the recommendation of the Steering Committee as described above. The conference theme was "Co-design of Radiocommunication Terminals: From Waves to Silicon through DSP." General Chairman was Professor Marco Luise of University of Pisa who was assisted by Giorgio Vittetta for local arrangement and by Fillipo Giannetti for publication, both from University of Pisa. Technical Program Committee consists of three co-chairs, T. Itoh (UCLA), U. Mengali (University of Pisa) and C. Trullemans (Catholic University of Louvain, Belgium). The TPC Co-chairs were assisted by 6 Vice Co-chairs and 18 committee members from various parts of the world. The meeting was technically co-sponsored by IEEE Communications Society, Microwave Theory and Techniques Society and Electron Devices Society.

The conference theme "Co-design of Radio-communication Terminals: From Waves to Silicon through DSP" is particularly timely. According to Professor Louise it is likely that by the year 2010 the number of wireless communication links for information transmission will exceed the number of wired ones. Each and every wireless communication application, be it high-speed point-to-point or switched cellular, terrestrial or satellite-based, UHF or mm-wave, has benefited in terms of spectral and power efficiency by advances in VLSI, microwave and DSP components and techniques. The ultimate goal of the radiocommunication engineer is currently to exploit the sinergy of those advances through clever co-design of different, previously separately-designed subsystems. The Symposium will develop through parallel sessions in three main areas of DSP-based Communication Equipment and Systems, VLSI design and Components, and Microwave Theory and Techniques. All TPC shared his view in forming the technical program.

Following the reception in the evening of 29 September, the conference started on the morning of 30 September by a brief opening ceremony. Each morning of the following three days was started with an Invited Plenary Talk. These talks were:

- "Microwave Power Amplifiers Fabricated from Wide Bandgap Semiconductor Transistors", by R. J. Trew, U. S. Department of Defense, on September 30;
- "Wireless Communication System: The Design Challenge" by H. Meyr, RWTH Aachen, Germany, on October 1;
- "Single-chip CMOS Wireless Transceivers: Current Status and Future Prospect" by A. Abidi, UCLA, USA, on October 2.

After the Prenary Talk, there were three parallel sessions, a total of 21, typically one for Microwaves, one for Telecommunications and one for VLSI.

Microwave Sessions:

WM1: Advances in Devices
WM2: New Materials and Architecture for Microwave and RF Circuits
TM 1: Progress of Numerical Characterization
TM 2: Millimeter Waves
TM 3: MW/Optical Interactions
FM 2: Nonlinear Circuit Design and Modeling

Telecommunication Sessions:

WT1: Broadband Wireless Access
WT2: Transmission Systems
WT3: Multiple Access
WT4: DSP for Telecommunications
TT 1: Signal Detection and Synchronization
TT 2: Wireless Transceivers
TT 3: Modulation, Coding and Compression
FT 1: Third-Generation Wireless Systems
FT 2: Wireless Channel Equalization

VLSI Sessions:

WV1: Wireless Transceivers
WV2: VLSI Technologies for RF Circuits
WV3: Broadband Techniques
TV 1: Data Communication/Processing Circuits
TV 2: Hardware/Softwared Co-Design of Telecommunication Systems
FV 1: Modeling and Design Techniques

The TPC received 57 submitted papers (including 37 in telecommunications) from 23 countries of which 41 papers were accepted. In addition, there are 53 invited papers. Therefore, 94 papers were given in 21 sessions. Essentially, no incidence of no-show was encountered. The number of participants was about 125 that includes 20 students and 8 Young Scientists who received full service at the registration fee identical to that for students.

The conference was very well organized and carried out in an relaxed and congenial atmosphere. There were ample occasions of technical exchange at coffee breaks and on-site luncheons for all participants. An excellent banquet was organized at a local restaurant with excellent Italian cuisine. On the afternoon of the third day, there was an optional excursion to a nearby town of Lucca.

During the conference, a meeting of the ISSSE Steering Committee was held including several guests and organizers and TPC members. The next venue was discussed. Recommended candidates are Japan and United States in that order. The final decision will take place in the near future.

T. Itoh, Chair ISSSE Steering Committee

EMC Zurich '99

Zurich, Switzerland, 15-18 February 1999

The 13th International Zurich Symposium & Technical Exhibition on Electromagnetic Compatibility will be held in Zurich, Switzerland from 16 to 18 February 1999. On 15 February there will be Tutorials and Joint Events. EMC Zurich'99 is organised by the Communication Technology Laboratory, Swiss Federal Institute of Technology, Zurich. Sponsor: Swiss Electrotechnical Association (SEV)

There are 131 technical papers in thematic sessions, workshops, tutorial lectures, open meetings, technical exhibition, technical excursions, a social programme including guests' excursions to pleasant Swiss resorts.

Topics

- Protection and Mitigation
- EMC Management
- Bio–Electromagnetic Interactions
- ESD and Fast Transients
- EMC in Extended Systems I: Theory and Modelling
- Antenna Calibration for EMC Testing
- Transients
- Board and Chip–Level EMC I: Modelling
- Measurement Technology I & II
- Power System EMC
- Numerical Methods
- EMC in Extended Systems II: Applications
- Transmission Lines
- EMC Innovation
- Lightning Physics and Effects
- Board and Chip–Level EMC II: Practical
- EMC Test Chambers

Tutorial Lectures

- EMC Control in the New Industrial Environment
- EMC Modelling and Simulation Codes

Workshops

- Measurement Uncertainties in EMC Instrumentation
- New Measurement Techniques and Possible Future Standards in EMC
- Uncertainties in EMC Compliance Testing
- Electromagnetic Terrorism and Adverse Effects of High Power Electromagnetic Environments

Open Meetings

URSI Commission E, ESPRIT Project ESDEM, COST 244 (Biomedical Effects) and IARU Region 1

Contact

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http://www.nari.ee.ethz.ch/emc/emc.html

Day on Diffraction'99

St.Petersburg, Russia, 1-4 June 1999

Day on Diffraction'99 will be held in St.Petersburg, Russia, from 1-4 June 1999. The meeting is organised by the Faculty of Physics of St.Petersburg University, the St.Petersburg Branch of Steklov Mathematical Institute and the Euler International Mathematical Institute. It is co-sponsored by the Russian Foundation for Basis Researches, IEEE ED/MTT/AP St.Petersburg Chapter and URSI.

Prof. V.M.Babich and Prof. V.S.Buldyrev are co-chairmen of the Organising Committee.

Topics

- Asymptotic Methods
- Mathematical Aspects of Wave Phenomena Inverse Problems
- Scattering and Diffraction
- Boundary-Contact Problems
- Waveguides and Resonators
- Rays and Beams
- Waves in Non-Uniform Media
- Boundary Layers
- Nonlinear Waves
- Propagation in Random Media
- Numerical Approaches

The working language is English. Abstracts are to be sent to : Prof V.M.Babich, Steklov Mathematical Inst., Fontanka 27, St.Petersburg 191011 Russia, Fax: +7-812-310-5377, E-mail : babich@ pdmi.ras.ru or to Prof V.S.Buldyrev, Inst. on Physics, St.Petersburg University, Petrodvoretz 198904 Russia, Fax: +7-812-428-7240, E-mail :buld@mph.phys.spbu.ru Paper Submission Deadline: March 15, 1999

Contact

Ivan Andronov E-mail : iva@AA2628.spb.edu or Valery Grikurov E-mail : grikurov@mph.phys.spbu.ru
http://mph.phys.spbu.ru/dd99/dd99.html

1999 International Conference on Computational Electromagnetics and Its Applications

Beijing, China, 1-4 November 1999

The 1999 International Conference on Computational Electromagnetics and Its Applications(ICCEA'99) will be held in Beijing, China on Nov 1 - 4, 1999. This is the second conference on Computational Electromagnetics and Its Applications in China since the first conference was held successfully in 1994. This conference is organized and sponsored by The IEEE Beijing Section, China Committee for URSI , Chinese Institute of Electronics and other organizations. The working language is English.

Topics

1. Computational Electromagnetics Theories and Techniques:
Analytical techniques (Green's function, Integral Equation, Variation, Mode Matching, etc.), Low-frequency numerical techniques (MOM, FDTD, FEM, TLM, etc.), High-frequency numerical techniques (PO, GO, GTD, UTD, etc.), Approximation techniques (Perturbation Methods, Least Squares, Interactive, etc.), Wavelet & Multi pole techniques Hybrid methods Optimization Genetic algorithms

2. Applications:
Antennas and Arrays SAR, Radar imaging Stealth techniques EMP,EMI/EMC Wave propagation, Dielectric & magnetic materials Radar cross section, Microwave Chamber & shielded enclosures Bio-electromagnetics, Millimeter wave & microwave components, Visualization Fiberoptics Inverse scattering, Communications systems MIMIC technology & VLSI Eddy currents non-destructive evaluation Remote sensing & geophysics, Target identification Propagation through plasmas, Temporary EMF

3. Computer Software Techniques:
Code validation and code performance analysis, Examples of practical code application, New codes, algorithms, code enhancements, and code fixes, Parallel algorithms

Deadlines

Paper Submission Deadline: Feb.28, 1999
Notification of Acceptance :May 30, 1999
Camera-Ready Manuscript Deadline: Aug.30, 1999
Submit Papers to : Prof. Gao Benqing, Dept. of Electronics Engineering, Beijing Institute of Technology, P.O.Box 327, Beijing 100081, CHINA, Tel:(86)10-68912613, Fax:(86)10-68412889

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URSI CONFERENCE CALENDAR

January 1999

Commsphere'99
Toulouse, France, 25-28 January 1999
Contact : Dr. Pierre Baüer, CESBIO, 18, avenue Edouard Belin, F-31401 Toulouse Cédex 4, France, Tel : +33 5-6155 8525, Fax : +33 5-6155 8500, e-mail : pierre.bauer@cesbio.cnes.fr, http://www.cnes.fr/actualites/commsphere

February 1999

13th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility
Zurich, Switzerland, 16-18 February 1999
Contact : Dr. Gabriël Meyer, Communication Technology Laboratory, Sternwartstraße 7, CH-8092 Zurich, Switzerland, Tel. +41 1-632 2790, Fax +41 1-632 1209, E-mail : gmeyer@nari.ee.ethz.ch, http://www.nari.ee.ethz.ch/emc/emc.html

March 1999

10th MICROCOLL
Budapest, Hungary, 21-23 March 1999
Contact : Ms. K. Lang & Mr. A. Varga, Diamond Congress Ltd. - Microcoll, Fo u. 68, H-1027 Budapest, Hungary, Tel. +36 1-214 7701, Fax +36 1-201 6383, E-mail : diamond.eft@mtesz.hu, http://www.mtesz.hu/tagegy/diamond/eindex.htm

June 1999

Day on Diffraction 99
St.Petersburg, Russia, 1-4 June 1999
Contact : Ivan Andronov or Valery Grikurov, Inst. on Physics, St. Petersburg University, Petrodvoretz 198904 Russia, Fax: +7-812-428-7240, E-mail : grikurov@mph.phys.spbu.ru

August 1999

Radio Methods for Studying Turbulence
Urbana, Illinois, USA, 9-12 August 1999
Contact : Prof. A. W. Wernik, Space Research Center, Polish Academy of Sciences, ul. Bartycka 18a, 00-716 Warsaw, Poland. Tel +48-22-403766 ext 379; fax +48-22-403131; email aww@cbk.waw.pl

XXVIth URSI General Assembly
Toronto, Canada, 13-21 August 1999
Contact : URSI GA '99 Secretariat, National Research Council Canada, Ottawa, Ontario K1A 0R6, Canada, Tel. +1 613-993 7271, Fax +1 613-993 7250, E-mail : ursi99@nrc.ca, http://www.nrc.ca/confserv/ursi99/welcome.html

November 1999

ICCEA'99
International Conference on Computational Electromagnetics and its Applications
Beijing, China, 1-4 November 1999
Contact : Mr. Meng-Qi Zhou, P.O. Box 165, Beijing 10036 China, fax +8610 6828-3458, E-mail : mqzhou@public.bta.net.cn

The Universe at Low Radio Frequencies
Pune, India, 30 November - 4 December 1999
Contact : Prof. V.K. Kapahi, NCRA-TIFR, Pune 7, India, Tel. +91 212-35 5149, Fax +91 212-35 7257, E-mail vijay@ncra.tifr.res.in

April 2000

AP 2000
Davos, Switzerland, 9-14 April 2000
Contact : AP 2000, ESTEC Conference Bureau, Postbus 299, NL-2200 AG Noordwijk, The Netherlands, Tel: +31 71 565-5005, Fax: +31 71 565-5658, E-mail: confburo@estec.esa.nl

August 2000

ISAP 2000
Fukuoka, Japan, 22-25 August 2000
Contact : Dr. Yoshio Karasawa, ISAP 2000, KDD R&D Labs, Inc. 2-1-15 Ohara, Kamifukuoka-shi, Saitama 356-8502, Japan, Tel. +81 492-78 7327, Fax +81 492-78 7524, E-mail karasawa@lab.kdd.co.jp

URSI cannot be held responsible for any errors contained in this list of meetings.
The Guidelines and Rules for URSI Sponsorship of Meetings can be found at ***http://www.intec.rug.ac.be/ursi/Rules.html***

News from the URSI Community

NEWS FROM THE MEMBER COMMITTEES

FINLAND

XXIII URSI National Convention on Radio Science

The URSI 1998 National Convention on Radio Science (NCRS'98) was held in Espoo, Finland on 24-25 August 1998. For the first time, NCRS and the annual Remote Sensing Symposium (RSS) were organized jointly. The quality of the presentations and the total attendance of 144 scientists proves that the recipe worked well.

The NCRS/RSS meeting was hosted by the Laboratory of Space Technology of the Helsinki University of Technology, and it was sponsored by the Finnish National Committee of URSI, Remote Sensing Club of Finland, IEEE Finland Section, and Nokia Corporation. The meeting was co-chaired by Martti Hallikainen (URSI National Committee) and Eero Ahokas (Remote Sensing Club of Finland). Jaan Praks was Secretary of the Organizing Committee.

The four main topics of the meeting were Remote sensing technology and applications (50 presentations); Antennas, propagation and radio channel (22 presentations); Space weather (6 presentations); and Bioelectromagnetism (5 presentations). Remote sensing sessions included instrumentation, forest and land use, water and ice, snow, atmosphere, and image interpretation and neural networks.

The Young Scientist Award winner Juha-Pekka Luntama (right) and NCRS/RSS chairman Martti Hallikainen (left).

The telecommunication sessions dealt with CDMA and access networks, signals and systems, and radio channel and antennas. The official languages of the meeting were Finnish and English.

The four plenary presentations dealt with next generation smart antennas for mobile telecommunication (by Kari Leppänen, Nokia Corporation), Finnish space strategy and international cooperation (by Esa Panula-Ontto, Technology Development Centre), European Union's Centre for Earth Observation Programme (by Katri Isotalo, EU Joint Research Centre), and commercial use of remote sensing (by Jussi Paavilainen, Satellite Image Centre). The five additional invited presentations dealt with EUMETSAT activities (by Jorma Riissanen, Finnish Meteorological Institute), production of radar mosaics of the rain forest belt in Africa (by Yrjö Rauste, EU Joint Research Centre), bioelectromagnetism (by Toivo Katila, Helsinki University of Technology), space weather (by Heikki Nevanlinna, Finnish Meteorological Institute), and propagation modelling in mobile telecommunication (by Jaakko Lähteenmäki, VTT).

The meeting attendance was 144 while the number of presentations was 83, meaning that the attendance was 70% higher than the number of presentations. The meeting also featured a small-scale exhibition (6 companies) on image processing. A reception and – of course – sauna were offered to attendees on 24 August.

A 174-page publication consisting of 2-page abstracts was printed and distributed to attendees. The meeting details are available at http://www.space.hut.fi/ursi-rs98.

The presentations by young scientists were evaluated by the Awards Committee, and the NRSC'98 Young Scientist Award for the best paper and oral presentation was won by Juha-Pekka Luntama from Helsinki University of Technology. His presentation dealt with atmospheric radio occultation measurements using GPS satellites.

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India

Frontiers of Electronics, Communications and Photonics

The National Conference on Frontiers of Electronics, Communications and Photonics will be held in Burdwan from 22 to 24 February 1999. It is the second of the series following one in Calcutta and Burdwan (January 1996).

The objective of the conference is, in general, to provide a forum for the researchers in which to explore the future directions in these fields. The conference is sponsored by the Indian Committee for URSI which is formed by the Indian National Science Academy.

The working language of the conference is English. Everyone interested in radio science is welcome.

The relevant topics of interest include but are not restricted to the following : Integrated Antennas, Optical Transport of Microwave Signals, Numerical Modelling of Microwave and mm-wave Circuits, Computer Modelling of Electronic and Optical Devices, Synchronisation of Communications Systems, Modelling of Signals and Systems, Electromagnetic Interference Analysis and Control, Navigation Systems, Noise Analysis, Terrestrial and Planetary EM Noise, High Power Electromagnetics, Spectrum Management, Optical Space Communications

The conference will offer a limited number of invited papers by experts of international repute. A limited session for post-deadline papers on newest evolution and the latest results is planned.

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Fifth biennial conference on Signal Processing and Communications

The Fifth biennial conference on Signal Processing and Communications (SPCOM '99) will be held at the Indian Institute of Science, Bangalore from 21to 24 July 1999. It is jointly organised by the Indian Institute of Science and the Jawaharlal Nehru Centre for Advanced Scientific Research

Signal processing and Communications are tightly interwoven and exert great influence on each other. There has been a tremendous spurt of research activity in these fields in recent years due to the rapid advances in technology. This has also given rise to a multitude of applications which demand novel and innovative signal processing algorithms. This conference provides a forum for researchers from academia, research laboratories, and industries to come together to share current developments in these emerging fields. SPCOM'99 is the fifth in the series of the biennial events, which have been organised, since 1990, at the Indian Institute of Science.

Original contributions, based on theoretical and experimental work, are solicited in the areas of signal processing and communications. Topics of interest include, but are not limited to: Signal Processing Algorithms, Wireless Communications, Signal Processing Architectures, Modulation, Coding and Encryption, Nonlinear Signal Processing, Speech Recognition, Multirate DSP & Wavelets, Speech and Audio Compression, Time—Frequency Representation, Image and Video Compression, Array Signal Processing, Biomedical Signal Processing, Image Processing and Vision, Multimedia Signal Processing

An exposition of the state-of-the-art technology, within the areas of the conference, developed in the country, is planned at the conference.

Tutorials on Speech Recognition & Compression and Mobile Cellular Commmnication will be held.

Deadlines

Full Paper due : January 1, 1999
Notification of acceptance : April 15, 1999
Final manuscript due : May 15, 1999
Tutorials : July 21, 22, 1999
Technical Sessions : July 23, 24, 1999
Advance program and registration material will be mailed by May 15, 1999.

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PROFILE OF A MEMBER COMMITTEE

GERMANY

The ancestor of URSI the „Commission Internationale de Télégraphie sans Fil Scientifique" was officially launched in April 1914 when delegates from Austria, Belgium, France, Germany and the Netherlands met in Brussels. One of the German representatives, M. v. Wien, became the first Vice-President of the Commission. The international co-operation, which had started so hopefully, came to a sudden end in August of the same year when the world was plunged into the first world war.

In the years after the war, the growing importance of radio wave propagation for communication led to intensified research and industrial activities in Germany but it took until 1938 before a national Member Committee was integrated within URSI, at the occasion of the General Assembly in Venice. Unfortunately the new development was again interrupted by the outbreak of the second world war only one year later.

In 1950, when life in Germany began to normalise again, different governmental agencies and research institutes in the field of wave propagation and telecommunication created the „Arbeitsgemeinschaft Ionosphäre". The exchange of data was organised and annual meetings were held with financial support of the German Postal Service. This working group formed the nucleus of the new German URSI Committee which was established 1952 to 1953. For several years radio scientists from East Germany participated in all activities of this Committee. But very soon the Cold war made itself felt. In 1969 the General Assembly in Ottawa admitted the German Academy of Science in Berlin, on the territory of the former D.D.R., as an additional Member Committee. Since then Germany had two Committees with very little mutual contacts. With the German unification in 1990 the member Committee in the former German Democratic Republic resigned. Most of its members joined the Committee in the Federal Republic which now represents again the whole country.

Germany contributed actively to the international affairs of URSI and its ancestor, the CITFS. For the period prior to the VIIth General Assembly in 1946, and in addition to the activities of M. v. Wien already referred to, J. Zenneck should be mentioned who was elected Vice-President of URSI in 1938.

From 1963 to 1969, W. Dieminger served as Vice-President of URSI, and as President from 1969 to 1972; he was elected Honorary President in 1978. H.J. Albrecht was Vice-President and Treasurer from 1984 to 1990. Eight members of the German Committee were elected as Chairs of Commissions. The 1966 General Assembly was held in Munich.

The annual event of the Committee is the „Kleinheubacher Tagung" which is always held near Miltenberg in northern Bavaria at the beginning of October. The scientific programme covers the full range of the 10 URSI-Commissions, but different topics are emphasised every year. The contributions are published in the proceedings „Kleinheubacher Berichte". Due to the support of the German Telecom the meeting has a low registration fee, which makes it attractive not only for German URSI-members.

In the course of the „Kleinheubacher Tagung" the members of the national Committee are convoked for a business meeting, where scientific activities and the admittance of new members are discussed. According to the status of the Committee Members are proposed individually and elected solely on the basis of their own published contributions to science and especially to URSI meetings. Officials are elected at intervals of three years.

Dr. K. Dorenwendt
President of the German Member Committee

PROFILES OF DEPARTMENTS

Radio Science at the Department of Applied Physics of the Eindhoven University of Technology

The Department of Applied Physics of the Eindhoven University of Technology (TUE) has a long-standing tradition in Plasma Physics. In the group Theoretical Physics this tradition concentrates on propagation of all kinds of waves in homogeneous and inhomogeneous plasmas. Through contacts with the Royal Netherlands Meteorological Institute (KNMI) and the Westerbork Synthesis Radio Telescope (WSRT) interest in ionospheric wave propagation was initiated in the late 1970's. At that time the ionosphere still was an active field of research at the KNMI and the observers at the WSRT were trying to find correction methods for position shifts of observed celestial radio sources induced by ionospheric refraction. As a result of mutual interest, a long-term collaboration between the three institutes set in, resulting in various Ph.D.-theses and publications.

Since it was clear that the quasi-periodic oscillations in the observed position of celestial radio sources were caused by ionospheric irregularities, the work concentrated on the so-called traveling ionospheric disturbances (TIDs). Kelder from the KNMI and Spoelstra from the WSRT started studying the propagation of electromagnetic and atmospheric waves in the ionosphere. Starting with an improved expression for the refractive index for the ionospheric plasma, a theoretical method to obtain information about the distribution of the electron density from the signals of beacon satellites was described. The same was done for radio-astronomical observations. Subsequently the characterization of the TID signatures in the WSRT observations was treated and related to the propagation of internal acoustic gravity waves in the ionosphere (as already suggested by Hines).

The above-mentioned quasi-periodic oscillations in the position of celestial radio sources result from variations in the length of the ray path of the radio signals crossing the ionosphere since the refractive index at radio wavelengths depends upon the electron density. In the late 1980's van Velthoven cs, in a joint Dutch-French venture, employed the (two-dimensional) radio interferometric observations by the WSRT and differential Doppler shift measurements of signals from the Navy Navigational Satellite System (NNSS) to determine the direction of propagation of TIDs. As a byproduct the total electron content (TEC) was determined as a function of latitude.

Van Velthoven cs also gave a climatological analysis of TIDs, based upon 5500 radio interferometric observations, made between 1980 and 1988 with the WSRT. The climatological results gave indications for the relative importance of various suggested mechanisms for excitation of the acoustic-gravity waves that are associated with the TIDs, and they showed the effects of observational biases. It was found that the amplitude and the frequency of occurrence of these TIDs show a large maximum at noon, a smaller maximum at night and minima around sunrise and sunset, during all seasons except summer. The daily variation is partly explained by the daily variation of the ionospheric electron density. The nighttime maximum may reflect an actual maximum in wave activity. The daily variation suggests that the solar terminator or auroral sources do not contribute substantially to the excitation of the waves. The period of the medium scale TIDs shows a diurnal variation with a large maximum around noon and a minimum at about midnight. The mean period of the waves is quite close to the Brunt-Vaisala period, implying that some of the observed waves may be evanescent gravity waves. Van Velthoven found no correlation between the wave parameters and geomagnetic activity. The amplitude of TIDs varies in the course of the solar cycle. A maximum occurred between 1981 and the beginning of 1984, somewhat retarded with respect to the solar cycle maximum in 1980-1081. It is probably due to the variation of the ionospheric electron density during the solar cycle. The horizontal wave number spectrum exhibits universal characteristics also displayed by gravity wave spectra lower in the atmosphere. At night, surprisingly, not only TIDs were observed, but also almost stationary east west oriented ridges of ionization, close to the equatorward wall of the nighttime midlatitude trough in the ionospheric electron content. It was proposed that these ridges be due to downward transport of plasma along the geomagnetic field lines. Van Velthoven also discussed the importance of various sources of TIDs. Auroral sources and the solar terminator could be excluded as the dominant source on account of the climatological analysis. In view of large horizontal phase velocities it was argued that the waves could not be of direct tropospheric or middle atmospheric origin. Possibly nonlinear interaction of large amplitude gravity waves or tides could excite secondary gravity waves with horizontal phase velocities that are larger than the horizontal phase velocity of the primary wave.

During the work on the above-mentioned projects, it became clear that the Westerbork database that incorporated all the calibration measurements of celestial point sources for the period 1970-1991 (and beyond) might be employed even further in order to find out more about the excitation mechanisms for the TIDs. In a collaboration between the WSRT and our department (ionospheric research at the KNMI was terminated in 1986/1987), Koekkoek cs obtained a more exhaustive climatology of TIDs from the more than 38.000 calibration measurements. This climatology showed that no clear correlation could be found between the frequency of occurrence, the amplitude and the period of TIDs on the one hand, and the activity of the sun on the other hand. Furthermore, the daily variation of the frequency of occurrence of TIDs turned out not to be consistent with the daily variation of the visibility of ionospheric irregularities caused by the daily variation of the electron density. Therefore it was concluded that earth-related excitation sources have to be considered. Internal gravity waves in the neutral atmosphere excited by the middle atmospheric jet stream were shown to produce the most important contribution to the observed TID characteristics.

Koekkoek cs employed the nonlinear Navier-Stokes equations in the Boussinesq approximation to derive the conditions under which the excitation of internal gravity waves by an unstable jet stream occurs most efficiently. The seasonal variation of the frequency of occurrence of TIDs could be explained by the seasonal variation of the wave-induced turbulence in the upper mesosphere. This turbulence, which affects the propagation of "high speed gravity waves", excited by the middle atmospheric jet stream, reaches a minimum in the winter season due to the filtering of the "propagating modes" in the tropospheric gravity wave spectrum by the zonal winds in the lower stratosphere. In the case of a sudden stratospheric warming due to breaking planetary waves, this minimum may be shifted to January/February and can then explain the observed maximum of the frequency of occurrence of TIDs during these months. The daily variation of the amplitude of TIDs, which is dominated by the semi-diurnal component, showed that the wave-induced turbulence in the upper mesosphere was modulated by the semi-diurnal thermal tide. During the winter, the amplitude of TIDs reaches a minimum around sunrise and sunset. Then, the phase of the semi-diurnal tide is such that the damping of the "high speed gravity waves" is largest. The fact that the effect of

the solar terminator was not present during these periods of maximum damping, supported the view that the middle atmospheric jet stream is the main excitation source for TIDs.

A recent enterprise in which our department and the WSRT have been involved concerns tomography of the ionosphere. This is a quite recent method to process ionospheric observations in order to produce two-dimensional cross-sections of the ionosphere's electron density. In a general way, tomography is the technique to reconstruct a spatial distribution from its line integrals, or, if one like, projections. In the ionosphere, these line integrals are measured by the before-mentioned differential Doppler technique. By this technique, one can determine the line integral of the electron density along a line of sight (phase path, in fact) from a radio transmitter carried by a satellite to a receiver on earth. The satellites of the NNSS were very well suited to this kind of measurement. Measurements that were suitable for tomographic inversion were obtained from receivers placed along a meridian, so as to lie in the same plane as the passing satellite. As the lines of sight lie in the same surface, a cross-section's plane is thus formed.

One of the main problems of ionospheric tomography is the fact that the inversion is extremely sensitive to small variations in the data. This instability can be seen as a consequence of the attempt to make a reconstruction based on incomplete information. In the ionospheric case this results from the lack of horizontal line integrals, or ditto lines of sight. A set of such line integrals would contain information on the vertical profile of the ionosphere's electron density. Its absence makes that the inverse problem is ill posed. There is not enough information in the data to make a reliable reconstruction: the vertical structure will not be recovered completely. Existing algorithms that transform the measurements to cross-sections of electron density always included model ionospheres that compensate for the missing information on the vertical structure. Fehmers cs constructed a new algorithm that uses a minimum of model information.

This algorithm was subsequently employed to invert the measurements that came out of an experiment, in which five receivers were installed along a line from Harlingen to Marseille. It turned out that the maximum electron density of the Netherlands, as determined by tomography, agreed well with independent soundings by the Royal Netherlands Army. More interesting was the appearance of a daily variation in the height of maximum electron density. This variation is consistent with theory.. The discernibleness of this variation proved the claim that tomography could indeed pronounce upon the vertical structure, despite the problem of the missing horizontal line integrals. Fehmers cs also discussed how tomography can be used to discern disturbed stratified structure such as TIDs, and the ionospheric trough, in the ionosphere.

For the time being the project on ionospheric tomography seems to be the last one on ionospheric radio science in our department. Ionospheric research in the Netherlands is nowadays down to nothing.

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Laboratory of Space Technology at Helsinki University of Technology

The Laboratory of Space Technology (LST) at Helsinki University of Technology (HUT) was established in 1988 to provide university-level education in remote sensing, spaceflight instrumentation, satellite communications, and space research. Helsinki University of Technology is the only university in Finland that offers undergraduate and postgraduate programs in space technology.

The LST personnel consists mainly of Ph.D. and M.Sc. students working towards their degree. The main research field is remote sensing, especially microwave techniques, including sensor construction, airborne data collection, analysis of satellite data, and development of backscatter and emission models. The two long-term goals are development of algorithms to retrieve geophysical characteristics from satellite data and evaluation of the feasibility of near-future satellite sensors for various applications. With a research output of 32 person-years in 1998 LST is by far the largest remote sensing research unit in Finland.

LST operates its own research aircraft that is equipped with sensors constructed in the laboratory. The main application areas are remote sensing of boreal forest, sea ice, snow, water quality, and stratospheric ozone. A millimeterwave ozone radiometer is operated in collaboration with the Finnish Meteorological Institute in Sodankylä, northern Finland.

LST is actively involved in international research projects and scientific organisations. In 1998, international funding to LST is nearly as large as national funding from outside HUT. The main sources of international funding are European Space Agency and European Union.

For more information, please contact http://www.space.hut.fi.

Research Aircraft and Overview of Its Instrumentation

The Laboratory of Space Technology acquired a Short SC-7 Skyvan turboprop two-engine aircraft in 1994 and modified it into research use, Figure 1. The aircraft is equipped with a 1.5 m by 1.9 m rear cargo door and a seven meter long square-shaped 2 m by 2 m fuselage that is ideal for accommodating microwave remote sensing instrumentation. Skyvan can carry two pilots, eight researchers and remote sensing instrumentation in the nose cone, outside the fuselage, and in the cargo ramp. The aircraft is certified to operate in the FAR23 category.

The instrumentation used onboard Skyvan includes the following sensors:

- HUTRAD microwave radiometer (frequency range 6.8 to 94 GHz; constructed by LST)
- HUTSLAR side-looking airborne radar (9.5 GHz; constructed by LST)
- AISA imaging spectrometer (wavelength 450 to 900 μm, owned by the Finnish Forest Research Institute)
- Profiling pyrometer (owned by VTT).

Ancillary instrumentation includes the following sensors and systems:

- Navigation system
- Data localisation system
- Motion video system.

A customised navigation system has been designed and installed in Skyvan. The system is based on real time differential GPS with an accuracy of about 2 meters. The navigation system provides the pilots with a graphical display with symbolic map presentation, off-track indication and numerical navigation data. In-flight target selection and flight planning is possible based on a moving map display in the cabin. Scientific data localisation is performed using the GPS time signal. Video imagery of a target is recorded and displayed at the monitoring panel.

A new GPS receiver will be in operational use in early 1999. The new system will provide attitude information with an accuracy of 0.1°. Complete platform motion data is used to improve scientific data localisation by eliminating the effect of attitude errors. The system works in parallel with an inertial unit that provides backup data.

HUTRAD Radiometer

The Helsinki University of Technology RADiometer (HUTRAD) onboard the Skyvan aircraft is presently one of the most versatile airborne radiometers. It consists of a non-imaging subsystem and an imaging subsystem, Table 1. The non-imaging subsystem operates at six frequencies between 6.8 and 94 GHz, with vertically and horizontally polarised channels at each frequency. The imaging subsystem operates at 93 GHz and is also dual-polarised. The main technical characteristics of HUTRAD are close to those of the AMSR Earth observation instrument, to be launched onboard the EOS PM-1 and ADEOS-II satellites in 2000/2001.

The HUTRAD radiometer system is accommodated in the rear cargo bay of the Skyvan aircraft (Figure 2), separated by a wall from the passenger cabin where the operating panels are located. HUTRAD looks backwards along the flight track; during data collection the rear cargo door is replaced with a customised air flow control surface. Each receiver has its own measurement and control computer. The control computers are connected to the local area network, which carries data and control information between the radiometers and the file server and monitoring workstation. The nominal aircraft speed during data collection is 55 m/s.

HUTRAD is used to collect data for several applications, including land use, forest, water, sea ice and snow. These experimental data are needed to develop retrieval algorithms for spaceborne sensors. Most algorithms available in the literature up to date are empirical or semi-empirical; they rely on experimental data collected under controlled conditions (measurements of the physical characteristics of a target are conducted simultaneously with airborne data collection).

Subsystem	Non-Imaging						Imaging
	Low-Frequency Unit			High-Frequency Unit			
Receiver	1	2	3	4	5	6	7
Frequency (GHz)	6.8	10.65	18.7	23.8	36.5	94	93
Polarisation	H & V			H & V	4 SP	H & V	H & V
Incidence angle (deg)	50			50			50
Bandwidth (MHz)	310	120	750	750	400	2000	2000
Sensitivity (K) (integration time τ = 0.5 s)	0.25	0.60	0.35	0.20	0.30	0.50	0.40 (τ = 0.01 s)
Antenna beamwidth (deg)	5.0	3.2	3.7	4.0	4.0	3.0	1.6
Radiometer type	Dicke			Dicke		Total power	Total power
External calibration method	On ground			On ground		On ground In flight	On ground In flight
Scan method	N/A			N/A			Programmable conical
Swath width (km) (altitude 1 km)	N/A			N/A			1.32
Mean data rate (kbytes/s)	0.2			0.2			Imaging mode: 5 Non-imaging: 0.5
Data storage	2 GB mirrored hard disk						1.2 GB hard disk
In-flight display	TB: H and V data Video image			TB: H and V data Video image			TB: H and V image Video image

Table 1. Technical characteristics of airborne HUTRAD microwave radiometer system. H = horizontal polarisation, V = vertical polarisation, 4 SP = four Stokes parameters (see text), TB = brightness temperature.

HUTRAD Improvements in Progress

The 36.5 GHz receiver has been modified into a polarimetric radiometer, allowing measurement of all four Stokes parameters that characterise the polarisation state of the received emission. The first polarimetric measurements have been made confirming proper functioning of the receiver. Construction of the polarimetric calibration system will be completed in early 1999. The main

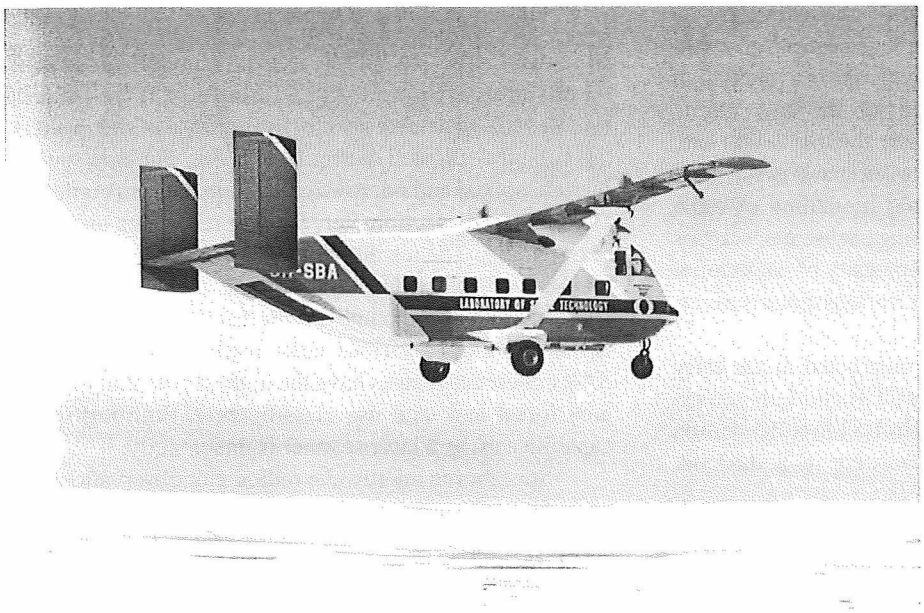

Figure 1. Skyvan research aircraft of HUT Laboratory of Space Technology collecting microwave radiometer data of sea ice in the Gulf of Bothnia. The cargo door is replaced with a customised airflow control surface to allow the use of the HUTRAD radiometer located in the cargo bay.

advantage of polarimetric radiometers is detection of target anisotropy and the most promising application is determination of the near-surface wind vector over oceans.

Construction of an interferometric 1.4 GHz radiometer is in progress, and it will be added to the HUTRAD system in 2000. The L-band radiometer consists of 36 dual-polarised antenna and receiver pairs whose in-phase and quadrature outputs are correlated using a one-bit digital correlator. The instrument will be mounted around the Skyvan cargo door frame in a U-shaped geometry. This allows measurement of a target at 1.4 GHz simultaneously with the presently available 6.8 to 94 GHz frequency range. The main advantages of interferometric techniques are reduction of the physical antenna aperture, and target imaging without mechanical or electrical scanning of the antenna.

Other Sensors Constructed by LST

Other sensors constructed by the Laboratory of Space Technology include the following:

- Helicopter-borne ranging scatterometer HUTSCAT that operates at 5.4 and 9.8 GHz, VV, HH, VH, and HV polarisations (HV: transmit horizontal polarisation, receive vertical polarisation).
- Helicopter-borne ranging scatterometer Miniscat that operates at 5.3 GHz, VV, HH, VH, and HV polarisations.
- Side-looking airborne radar that operates at 9.5 GHz, VV polarisation; it has a maximum range of 20 km.
- Ground-based millimeterwave radiometer that operates at 110 GHz and measures the amount of stratospheric ozone in the 20 to 75 km altitude range.

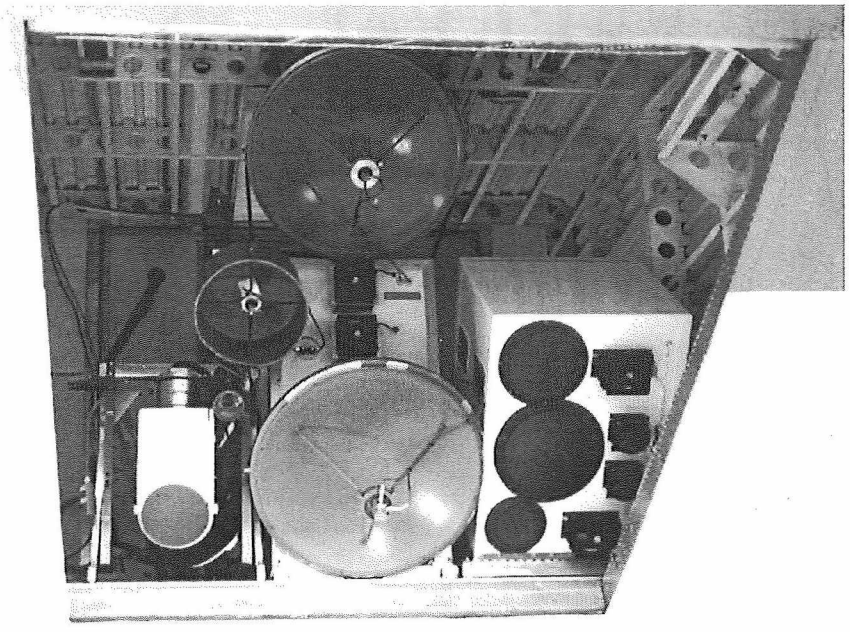

Figure 2. Photograph of the HUTRAD radiometer system onboard the Skyvan research aircraft. The system employs an incidence angle of 50° off nadir.
Left : Imaging 93 GHz subsystem
Middle : Low-frequency (6.8, 10.65, and 18.7 GHz subsystem
Right : High-frequency (23.8, 36.5, and 94 GHz subsystem.

HUTSCAT and Miniscat measure the intensity of backscatter from a target simultaneously at all channels (frequency and polarisation combinations) as a function of distance with a range resolution of 65 cm and 30 cm, respectively. Hence, they can measure the tree height and, consequently, the stem volume (or biomass) with good accuracy. They are also used to aid modelling of radar backscatter from forest by determining backscatter sources in forest canopies and the relative intensity of backscatter from forest canopy and ground at various polarisations, respectively.

The ozone radiometer was constructed in the early 1990's in a joint project with the HUT Radio Laboratory. The instrument is presently operated by LST in collaboration with the Finnish Meteorological Institute in Sodankylä, northern Finland.

Remote Sensing Applications and Recent Results

The main applications under study are remote sensing of boreal forest, sea ice, snow, water quality, and stratospheric ozone. Experimental data are often acquired in airborne remote sensing campaigns, complemented with satellite data. The main data sources are spaceborne and airborne microwave radiometers, radars (synthetic aperture radar, SAR), and optical sensors. Data processing tools include workstations and several software packages. Feasibility of remote sensing data to various applications is investigated in collaboration with institutes or companies that have expertise on these applications.

Land applications

In Finland alone, 16 MECU is spent annually on ground-based forest inventories. At LST, the feasibility of several remote sensing data sources for the retrieval of stem volume has been investigated during 1995-1998. The data sources include optical and microwave satellite data, airborne data from imaging spectrometer, ranging radar data and aerial photographs. The results show that profiling sensors (like HUTSCAT) provide stem volume estimates with an accuracy that is comparable with that of traditional forest inventory. Out of various radar methods, ESA ERS-1/2 SAR coherence images have the highest potential for large area forest and land use classification. Profiling sensor capability using a laser scanner is under study.

Spaceborne microwave radiometer observations can be employed to monitor environmental changes on a global scale. The research carried out by LST has focused on the development of parameter retrieval techniques for the boreal forest zone. The specific application areas include retrieval of snow extent and snow water equivalent, surface temperature, forest cover fraction and forest biomass. The techniques developed at LST have been successfully validated with data from the spaceborne SSM/I radiometer. HUTRAD data are presently used to determine the effects of various land-use categories to the brightness temperature of snow-covered terrain in the 6.8 to 94 GHz range, Fig. 3.

Similarly to radiometer data interpretation techniques, methods to utilise spaceborne radar observations of the boreal forest zone have been developed, including the LST semi-empirical forest backscattering model. Experimental

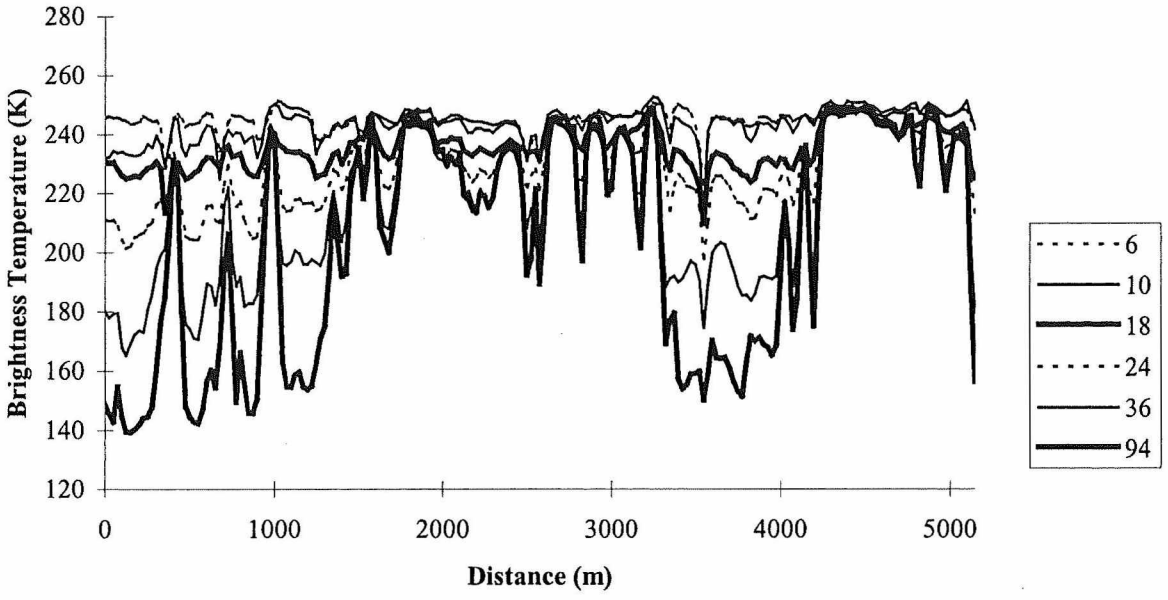

Figure 3. HUTRAD radiometer data for horizontal polarisation in the 6.8 to 94 GHz range on 29 January 1998. The test line near Helsinki includes various land-use categories and boreal forest with a maximum stem volume of 550 m³/ha. The snow depth was 20 ± 15 cm and air temperature -10°C. The brightness temperature decreases with increasing frequency and snow depth for non-forested areas, whereas it is nearly independent of frequency and snow depth for forested areas.

and modelling results demonstrate the feasibility of C-band spaceborne radar for monitoring changes in the soil moisture and state (thawed/frozen). Additionally, C- and L-band radars have been verified to have good potential for large area forest biomass monitoring when multi-temporal radar observations are employed.

Development of an operational system to monitor annual snow melt in Finland is in progress in collaboration with other national institutes. The method employs both traditional methods (in situ measurements and hydrological models) together with data from spaceborne ERS-2 SAR and NOAA AVHRR.

Sea ice

Timely information on the rapidly changing ice conditions in the Baltic Sea is essential for ice breakers that assist winter shipping traffic in Finland. Some 40% of the total import and export shipping transportation is done during the winter season. Spaceborne synthetic aperture radar (SAR) images are the only way to produce information on ice condition in fine scale independent of daylight and nearly independent of weather conditions. However, interpretation of SAR images is usually very difficult due to the complicated interaction of the radar signal with sea ice. To aid development of ice type and concentration classification algorithms LST has conducted airborne radar campaigns over a period of several years. These measurements are used to study radar response to different ice types in different environmental conditions. Recent results show that high incidence angle Radarsat SAR images are better for ice classification than low incidence angle images.

Water quality

Scenarios for operational remote sensing-aided water quality monitoring have been studied by employing extensive remote sensing and in situ data from the coastal and lake region in 1996-1998. The results show that imaging spectrometer data can significantly increase the accuracy of regional water quality information from that based on in situ sampling only.

Stratospheric ozone

The LST ozone radiometer, located in Sodankylä (N67.4, E26.5) makes 20 measurements per day and it can measure ozone also in cloudy weather. Both short-term and long-term variations of ozone in the 20 to 75 km range are monitored. Diurnal variation is substantial at higher altitudes, as demonstrated in Figure 4.

International Co-operation

The Laboratory of Space Technology presently participates in several international research projects funded by the European Space Agency (ESA) and European Union (EU). Scientific and technical co-operation activities are related to URSI Commission F, IEEE Geoscience and Remote Sensing Society, ESA Earth Sciences Advisory Committee, European Association of Remote Sensing Laboratories (EARSeL), and European Union. During 1992-1998, researchers from LST spent a total of 16 person-years working in research institutes outside Finland.

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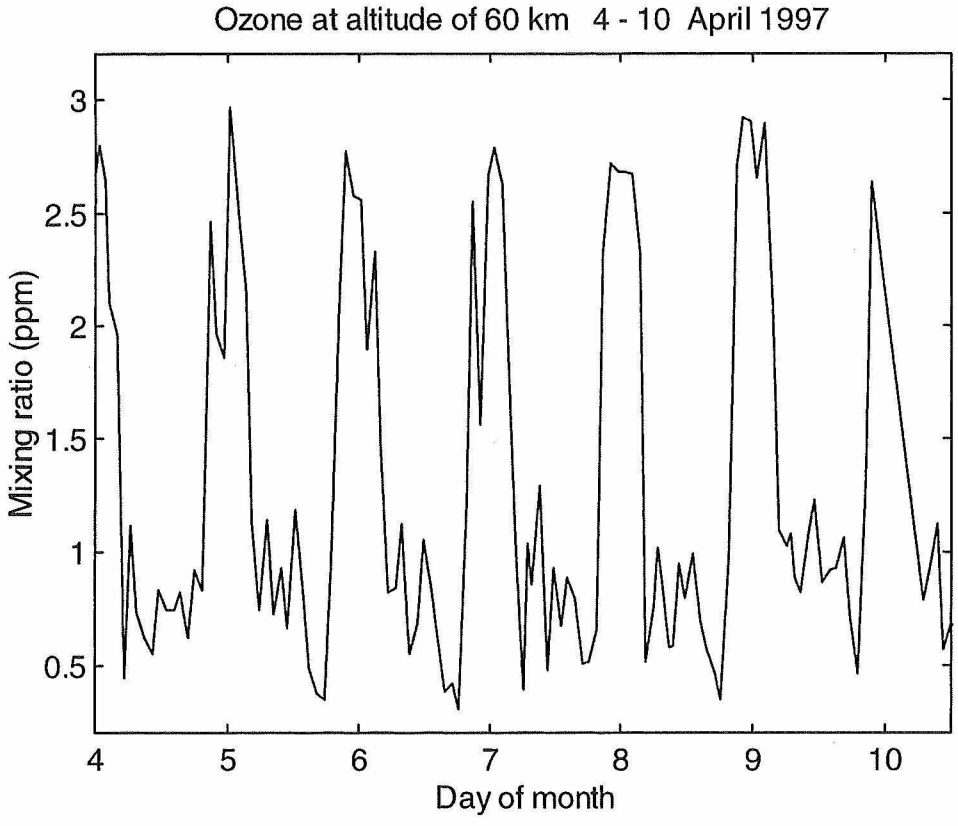

Figure 4. Observed mixing ratio of ozone at an altitude of 60 km. Measurements were made using the LST 110 GHz ground-based radiometer in Sodankylä, Finland. The smallest amounts of ozone are observed in the daytime.

BOOK PUBLISHED BY AN URSI CORRESPONDENT

Biophysical Aspects of Coherence and Biological Order

by J. Pokorny and Tsu-Ming Wu

Hardcover, 240 pp., 59 figs., 6 tabs
Co-edition of Springer Verlag with Academia Publishing House, 1998
Springer Verlag DM 179, ISBN 3-540-64651-5
Academia Publishing House Kc 790, ISBN 80-200-0704-0

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Living systems maintain a high degree of order. An inconceivable number of various molecules, structures, organelles, etc. interact, enter the biochemical reactions, join together, and form larger structures whose properties cannot be predicted from the characteristics of their parts. The biochemical, biophysical, and biological processes are coordinated at the same time and successively in time but the mechanisms of order and selforganization are largely unknown.

The book explains self-assembly and order on the basis of a biophysical mechanism using energy. Biological molecules and structures have extraordinary polar and polarization properties. Even the thermal vibrations are accompanied by polarization waves generating oscillating electric field capable of mediation of long range interactions. In particular, the cytoskeleton is an important structure of cellular organization. On account of non-linear properties energy supplied from metabolic sources (e.g. from GTP to the microtubules and from ATP to the actin filaments) can shift the vibrations far from thermodynamic equilibrium and excite coherent states. The generated coherent electric field can be essetial for creation and maintenance of order. The book presents the hypothesis that protein phosphorylation can control the coherent vibrations whose disturbances may be connected with certain properties of malignant cells.

The text of the book is accessible to biophysicists, biologists, biochemists, and to other scientists working in the interdisciplinary area between biology, chemistry, and physics. As the necessary mathematical, physical, and chemical items are explained in the appendices, the book may be used by a wide community of readers.

The Journal of Atmospheric and Solar-Terrestrial Physics

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AIMS AND SCOPE

The Journal of Atmospheric and Solar-Terrestrial Physics is an international journal concerned with the interdisciplinary science of the Earth's atmospheric and space environment. Papers are published on the results of experiments and their interpretations, and on theoretical or modelling studies. Papers dealing with remote sensing carried out from the ground or with *in situ* studies made from rockets or from satellites orbiting the Earth are particularly suitable. Plans for future research, often carried out as an international programme, are also discussed. Besides original research papers, discussion papers and short reports, the journal includes commissioned review papers on topical subjects and special issues arising from chosen scientific symposia or workshops. The journal covers the physical processes operating in the troposphere, stratosphere, mesosphere, thermosphere, ionosphere, magneto-sphere and heliosphere. Phenomena occurring in other "spheres'' and supporting laboratory measurements are also considered. The journal deals especially with the coupling between the different regions. Regarding the upper atmosphere, the subjects of aeronomy, geomagnetism, auroral phenomena, radio wave propagation and plasma instabilities are examples within the broad field of solar-terrestrial physics which emphasise the energy exchange between the solar wind, the magnetospheric and ionospheric plasmas, and the neutral gas. In the middle and lower atmosphere, the topics covered include dynamics, radiation and chemistry, atmospheric electricity and electrodynamic effects, including lightning and its effects, and anthropogenic changes. Helpful, novel schematic diagrams are encouraged as is the use of colour.

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International Geophysical Calendar 1999

	S	M	T	W	T	F	S
JANUARY						1	2
	3	4	5	6	7	8	9
	10	11	(12)+	13*+	(14)*	15	16
	17N	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31	1	2	3	4	5	6
FEBRUARY	7	8	9+	10+	11+	12+	13
	14	15	16N*	17*	(18)	19	20
	21	22	23	24	25	26	27
	28	1	2	3	4	5	6
MARCH	7	8+	9+	10+	11+	12+	13
	14	15	(16)	17N*	(18)*	19	20
	21	22	23	24	25	26	27
	28	29	30	31	1	2	3
APRIL	4	5	6	7	8	9	10
	11	12	(13)	14*	(15)*	16N	17
	18	19	20+	21+	22+	23	24
	25	26	27	28	29	30	1
MAY	2	3	4	5	6	7	8
	9	10	11	12	13	14	15N
	16	17	(18)*	19*	(20)	21	22
	23	24	25	26	27	28	29
	30	31	1	2	3	4	5
JUNE	6	7	8	9	10	11	12
	13N	14	(15)*	16*	(17)	18	19
	20	21	22	23	24	25	26
	27	28	29	30			
	S	M	T	W	T	F	S

	S	M	T	W	T	F	S
					1	2	3
JULY	4	5	6+	7+	8+	9	10
	11	12	(13)N*	14*	(15)	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
	1	2	3	4	5	6	7
AUGUST	8	9	(10)*	11N*	(12)	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	1	2	3	4
SEPTEMBER	5	6	7+	8+	9N+	10	11
	12	13	(14)*	15*	(16)	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	1	2
OCTOBER	3	4	5	6	7	8+	9N+
	10	11	(12)*+	13*+	(14)+	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31	1	2	3	4	5	6
NOVEMBER	7	8N	(9)*	10*	(11)	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	1	2	3	4
DECEMBER	5	6	7N*	8*	9	10	11
	12	13	(14)+	15+	(16)	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	1
2000	2	3	4	5*	6N*	7	8
JANUARY	9	10	(11)	12	(13)	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31					
	S	M	T	W	T	F	S

(12) Regular World Day (RWD)

13 Priority Regular World Day (PRWD)

17 Quarterly World Day (QWD) also a PRWD and RWD

6 Regular Geophysical Day (RGD)

8 9 World Geophysical Interval (WGI)

12+ Incoherent Scatter Coordinated Observation Day

N New Moon

16 Day of Solar Eclipse: Feb 16 & Aug 11

14 15 Airglow and Aurora Period

13* Dark Moon Geophysical Day (DMGD)

This Calendar continues the series begun for the IGY years 1957-58, and is issued annually to recommend dates for solar and geophysical observations, which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to World Data Centers (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Space Environment Service (ISES) with the advice of spokesmen for the various scientific disciplines. For some programs, greater detail concerning recommendations appears from time to time published in IAGA News, IUGG Chronicle, URSI Information Bulletin or other scientific journals or newsletters. For on-line information, see **http://www.sec.noaa.gov/ises/ises.html.**

The definitions of the designated days remain as described on previous Calendars. Universal Time (UT) is the standard time for all world days. Regular Geophysical Days (RGD) are each Wednesday. Regular World Days (RWD) are three consecutive days each month (always Tuesday, Wednesday and Thursday near the middle of the month). Priority Regular World Days (PRWD) are the RWD which fall on Wednesdays. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the World Geophysical Intervals (WGI). The WGI are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 1999 the WGI will be February, May, August and November.

The **Solar Eclipses** are:

- **16 February 1999.** An annular eclipse with annularity visible in a path across Australia from west to northeast, extending from north of Perth to near Cairns. A partial eclipse will be visible in the south Atlantic Ocean, southern Africa and Madagascar except its northern tip, Indonesia except for northwestern Sumatra, the extreme southern Malaysian peninsula including Singapore, the southern Philippines, Papua New Guinea, Australia, the southern island of New Zealand, and most of Antarctica. The magnitude will be 99.3%, with a maximum duration of 40 seconds.
- **11 August 1999.** A total eclipse with totality beginning in the Atlantic off the northeast American coast, reaching Europe at Land's End in Britain, and extending through parts of France, Belgium, Luxembourg, Germany, Austria, Hungary, Serbia, Romania, Bulgaria, Turkey, Iraq, Iran, Pakistan, and India. The magnitude of totality is 103%, and the maximum eclipse will occur over Romania and last 2 minutes 23 seconds. The path is especially narrow, never exceeding 113 km. The partial eclipse will be visible from northeastern US and Canada at sunrise, Greenland, all of Europe, most of Asia except the extreme east, and with the eastern limit extending southward through Bangaladesh and east of Calcutta in India. The northern half of Africa will also see a partial eclipse.

Web Sites: http://umbra.gsfc.nasa.gov/eclipse/predictions/eclipse-paths.html;
International Astronomical Union Working Group on Eclipses:
http://www.williams.edu/Astronomy/IAU_eclipses

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http://www.williams.edu/Astronomy/jay

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Chair, Working Group on Eclipses of the International Astronomical Union

Meteor Showers (selected by R. Hawkes, Mount Allison Univ, Canada, rhawkes@mta.ca) include the most prominent regular showers. The dates for Northern Hemisphere meteor showers are: Jan 3-5 (Quadrantid); Apr 21-23 (Lyrid); May 4-6 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Aug 11-14 (Perseid); Oct 21-23 (Orionid); Nov 16-19 (Leonid); Dec 13-15 (Geminid); Dec 22-24, 1999 (Ursid); and Jan 3-5, 2000 (Quadrantid). The dates for Southern Hemisphere meteor showers are: May 4-6 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Jul 27-Aug 2 (S. Delta-Aquarid, Alpha-Aurigid); Oct 21-23 (Orionid); Nov 16-19 (Leonid); and Dec 13-15, 1999 (Geminid).

The occurrence of **unusual solar or geophysical conditions** is announced or forecast by the ISES through various types of geophysical **"Alerts"** (which are widely distributed by telegram and radio broadcast on a current schedule). Stratospheric warmings (STRATWARM) are also designated. The meteorological telecommunications network coordinated by WMO carries these worldwide Alerts once daily soon after 0400 UT. For definitions of Alerts see ISES "Synoptic Codes for Solar and Geophysical Data", March 1990 and its amendments. Retrospective World Intervals are selected and announced by MONSEE and elsewhere to provide additional analyzed data for particular events studied in the ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) programs.

RECOMMENDED SCIENTIFIC PROGRAMS

OPERATIONAL EDITION

(The following material was reviewed in 1998 by spokesmen of IAGA, WMO and URSI as suitable for coordinated geophysical programs in 1999.)

Airglow and Aurora Phenomena. Airglow and auroral observatories operate with their full capacity around the New Moon periods. However, for progress in understanding the mechanism of many phenomena, such as low latitude aurora, the coordinated use of all available techniques, optical and radio, from the ground and in space is required. Thus, for the airglow and aurora 7-day periods

on the Calendar, ionosonde, incoherent scatter, special satellite or balloon observations, etc., are especially encouraged. Periods of approximately one weeks' duration centered on the New Moon are proposed for high resolution of ionospheric, auroral and magnetospheric observations at high latitudes during northern winter.

Atmospheric Electricity. Non-continuous measurements and data reduction for continuous measurements of atmospheric electric current density, field, conductivities, space charges, ion number densities, ionosphere potentials, condensation nuclei, etc.; both at ground as well as with radiosondes, aircraft, rockets; should be done with first priority on the RGD each Wednesday, beginning on 6 January 1999 at 0000 UT, 13 January at 0600 UT, 20 January at 1200 UT, 27 January at 1800 UT, etc. (beginning hour shifts six hours each week, but is always on Wednesday). Minimum program is at the same time on PRWD beginning with 13 January at 0600 UT. Data reduction for continuous measurements should be extended, if possible, to cover at least the full RGD including, in addition, at least 6 hours prior to indicated beginning time. Measurements prohibited by bad weather should be done 24 hours later. Results on sferics and ELF are wanted with first priority for the same hours, short-period measurements centered around the minutes 35-50 of the hours indicated. Priority Weeks are the weeks that contain a PRWD; minimum priority weeks are the ones with a QWD. The World Data Centre for Atmospheric Electricity, 7 Karbysheva, St. Petersburg 194018, USSR, is the collection point for data and information on measurements.

Geomagnetic Phenomena. It has always been a leading principle for geomagnetic observatories that operations should be as continuous as possible and the great majority of stations undertake the same program without regard to the Calendar.

Stations equipped for making magnetic observations, but which cannot carry out such observations and reductions on a continuous schedule are encouraged to carry out such work at least on RWD (and during times of MAGSTORM Alert).

Ionospheric Phenomena. Special attention is continuing on particular events that cannot be forecast in advance with reasonable certainty. These will be identified by Retrospective World Intervals. The importance of obtaining full observational coverage is therefore stressed even if it is possible to analyze the detailed data only for the chosen events. In the case of vertical incidence sounding, the need to obtain quarter-hourly ionograms at as many stations as possible is particularly stressed and takes priority over recommendation (a) below when both are not practical.

For the **vertical incidence (VI) sounding program**, the summary recommendations are: (a) All stations should make soundings on the hour and every quarter hour; (b) On RWDs, ionogram soundings should be made at least every quarter hour and preferably every five minutes or more frequently, particularly at high latitudes; (c) All stations are encouraged to make f-plots on RWDs; f-plots should be made for high latitude stations, and for so-called "representative" stations at lower latitudes for all days (i.e., including RWDs and WGIs) (Continuous records of ionospheric parameters are acceptable in place of f-plots at temperate and low latitude stations); (d) Copies of all ionogram scaled parameters, in digital form if possible, be sent to WDCs; (e) Stations in the eclipse zone and its conjugate area should take continuous observations on solar eclipse days and special observations on adjacent days. See also recommendations under Airglow and Aurora Phenomena.

For the **incoherent scatter observation program**, every effort should be made to obtain measurements at least on the Incoherent Scatter Coordinated Observation Days, and intensive series should be attempted whenever possible in WGIs, on Dark Moon Geophysical Days (DMGD) or the Airglow and Aurora Periods. The need for collateral VI observations with not more than quarter-hourly spacing at least during all observation periods is stressed.

Special programs include:

DATABASE — Incoherent Scatter Database — emphasis on broad latitudinal coverage of the F region (Anthony van Eyken - tony@eiscat.no);

Hi-TRAC — High Time Resolution Auroral Radar Convection (J. Holt — jmh@haystack.mit.edu);

LTCS — Lower Thermosphere Coupling Study (M. Buonsanto - mjb@haystack.mit.edu; C. Fesen - fesen@tides.dartmouth.edu);

POLITE — Plasmaspheric Observations of Light Ions in the Topside Exosphere — global coordinated measurements of topside light ions. Simultaneous optical observations of neutral hydrogen and helium are highly desirable where possible (Phillip Erickson - pje@hyperion.haystack.edu);

WLS — Wide-Latitude Substorm Dynamics (John Foster - jcf@hyperion.haystack.edu).

Special programs: Dr. Anthony P. van Eyken, EISCAT Scientific Association, Ramfjordmoen, N-9027 Ramfjordbotn, Norway. Tel. +47 77692166; Fax +47 77692380; e-mail: tony@eiscat.no; URSI Working Group G.5. See http://www.eiscat.uit.no/URSI_ISWG for complete definitions.

For the ionospheric drift or wind measurement by the various radio techniques, observations are recommended to be concentrated on the weeks including RWDs.

For traveling ionosphere disturbances, propose special periods for coordinated measurements of gravity waves induced by magnetospheric activity, probably on selected PRWD and RWD.

For the ionospheric absorption program half-hourly observations are made at least on all RWDs and half-hourly tabulations sent to WDCs. Observations should be continuous on solar eclipse days for stations in eclipse zone and in its conjugate area. Special efforts should be made to obtain daily absorption measurements at temperate latitude stations during the period of Absorption Winter Anomaly, particularly on days of abnormally high or abnormally low absorption (approximately October-March, Northern Hemisphere; April-September, Southern Hemisphere).

For back-scatter and forward scatter programs, observations should be made and analyzed at least on all RWDs.

For synoptic observations of mesospheric (D region) electron densities, several groups have agreed on using the RGD for the hours around noon.

For ELF noise measurements involving the earth-ionosphere cavity resonances any special effort should be concentrated during the WGIs.

It is recommended that more intensive observations in all programs be considered on days of unusual meteor activity.

Meteorology. Particular efforts should be made to carry out an intensified program on the RGD — each Wednesday, UT. A desirable goal would be the scheduling of meteorological rocketsondes, ozone sondes and radiometer sondes on these days, together with maximum-altitude rawinsonde ascents at both 0000 and 1200 UT.

During **WGI and STRATWARM Alert Intervals**, intensified programs are also desirable, preferably by the implementation of RGD-type programs (see above) on Mondays and Fridays, as well as on Wednesdays.

Global Atmosphere Watch (GAW) The World Meteorological Organizations (WMO) GAW integrates many monitoring and research activities involving measurement of atmospheric composition. Serves as an early warning system to detect further changes in atmospheric concentrations of greenhouse gases, changes in the ozone layer and in the long range transport of pollutants, including acidity and toxicity of rain as well as of atmospheric burden of aerosols (dirt and dust particles). Contact WMO, 41, avenue Giuseppe-Motta, P.O. Box 2300, 1211 Geneva 2, Switzerland.

Solar Phenomena. Observatories making specialized studies of solar phenomena, particularly using new or complex techniques, such that continuous observation or reporting is impractical, are requested to make special efforts to provide to WDCs data for solar eclipse days, RWDs and during PROTON/FLARE ALERTS. The attention of those recording solar noise spectra, solar magnetic fields and doing specialized optical studies is particularly drawn to this recommendation.

ISCS (International Solar Cycle Studies). Program within the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics): 1998-2002. Its focus is on observations and basic research directed toward understanding the underlying and resulting processes associated with the rising and maximum phase of a solar cycle. Contacts are S.T. Wu, Univ of Alabama, Huntsville Dept. Mech. Eng. & Ctr. for Space Plasma & Aeron. Res., Huntsville, AL 35899 USA, (205)895-6413, Fax (205)895-6328, wu@cspar.uah.edu, and V. Obridko, IZMIRAN, Solar Physics Department, 142092 Troitsk, Moscow, Russia, 095-344-0926, Fax 095-334-0124, obridko@lars.izmiran.troitsk.su.

Space Weather Month, October, 1999 — Solar Terrestrial Energy Program (STEP) Results, Applications, and Modeling Phase (RAMP) [S-RAMP]. The S-RAMP space weather month: global coordinated ground-based and space-borne observations of space weather phenomena covering the entire space weather chain from the surface of the Sun to the effects on the near-Earth space and ground-based technological systems. Contacts: Dr. David Boteler (Boteler@Geolab.nrcan.gc.ca) and Dr. Phil Wilkinson, IPS Radio and Space Services, P.O. Box 1386, Haymarket, NSW 1240, Australia, +61 2 9213 8003, Fax +61 2 9213 8060 (Phil@ips.gov.au).

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy. Experimenters should take into account that observational effort in other disciplines tends to be intensified on the days marked on the Calendar, and schedule balloon and rocket experiments accordingly if there are no other geophysical reasons for choice. In particular it is desirable to make rocket measurements of ionospheric characteristics on the same day at as many locations as possible; where feasible, experimenters should endeavor to launch rockets to monitor at least normal conditions on the Quarterly World Days (QWD) or on RWDs, since these are also days when there will be maximum support from ground observations. Also, special efforts should be made to assure recording of telemetry on QWD and Airglow and Aurora Periods of experiments on satellites and of experiments on spacecraft in orbit around the Sun.

The **International Space Environment Service (ISES)** is a permanent scientific service of the International Union of Radio Science (URSI), with the participation of the International Astronomical Union and the International Union Geodesy and Geophysics. ISES adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of the International Council of Scientific Unions (ICSU). The ISES coordinates the international aspects of the world days program and rapid data interchange.

This Calendar for 1999 has been drawn up by H.E. Coffey, of the ISES Steering Committee, in association with spokesmen for the various scientific disciplines in SCOSTEP, IAGA and URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications.

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Additional copies are available upon request to ISES Chairman, Dr. R. Thompson, IPS Radio and Space Services, Department of Administrative Services, P.O. Box 1386, Haymarket, NSW 1240, Australia (FAX number (61)(2)9213 8060; e-mail richard@ips.gov.au), or ISES Secretary for World Days, Miss H.E. Coffey, WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80303, USA (FAX number (303)497-6513; e-mail hcoffey@ngdc.noaa.gov).

The calendar is available on-line at :

http://www.sec.noaa.gov/ises/ises.html.

URSI Homepage

The URSI Homepage can be found at URL **http://www.intec.rug.ac.be/ursi**

At the moment this issue went to press the table of contents included the following :

A brief overview of URSI with a current list of Officers

A more detailed description of URSI
1. Origins
2. Scientific Commissions
3. Working Groups (including joint and inter-union working groups)
4. Standing Committees
5. Membership of URSI
6. URSI Correspondents
7. URSI Publications
8. URSI Statutes in French and in English
9. URSI General Assemblies
10. XXVIth URSI General Assembly, Toronto, Canada, 13-21 August 1999
11. URSI Young Scientist Programme at 1999 General Assembly
12. URSI Awards 1999
13. List of URSI Officers since the foundation of URSI

Conferences
1. URSI Conference Calendar
2. how to announce your conference in these pages
3. rules for URSI Sponsorship

News and reports from the scientific Commissions
1. Commission A
2. Commission B (link to the Com. B Homepage)
3. Commission C
4. Commission D
5. Commission E
6. Commission F
7. Commission G (link to the Com. G Homepage)
8. Commission H (link to the Com. H Homepage)
9. Commission J (link to the Com. J Homepage)
10. Commission K

News from the URSI Member Committees
Links to the sites of our Committees in Australia, Belgium, China, Germany, New Zealand, South Africa, Ukraine, United Kingdom, and the USA.

URSI Representatives on other Scientific Organisations

Other useful links

List of URSI Officials

Note : an alphabetical index of names, with coordinates and page references, is given on pages 54-67.

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