



## **The origin of plasmaspheric hiss: the seminal work and legacy of Prof. Richard M. Thorne**

Jacob Bortnik<sup>(1)</sup>, Nigel Meredith<sup>(2)</sup>, Richard B. Horne<sup>(2)</sup>, Wen Li<sup>(3)</sup>, Lunjin Chen<sup>(4)</sup>,

(1) Department of Atmospheric and Oceanic Sciences, University of California at Los Angeles, 90095, USA;  
email: [jbortnik@gmail.com](mailto:jbortnik@gmail.com)

(2) British Antarctic Survey, Natural Environment Research Council, Cambridge, England; email:  
[nmer@bas.ac.uk](mailto:nmer@bas.ac.uk), [rh@bas.ac.uk](mailto:rh@bas.ac.uk)

(3) Center for Space Physics, Boston University, Boston MA 02215, USA; e-mail: [wenli@bu.edu](mailto:wenli@bu.edu)

(4) William B. Hanson Center for Space Sciences, Department of Physics, University of Texas at Dallas,  
Richardson, Texas, USA; email: [Lunjin.chen@utdallas.edu](mailto:Lunjin.chen@utdallas.edu)

Plasmaspheric hiss, a broadband, incoherent plasma wave that propagates in the so-called whistler mode, is found ubiquitously in the Earth's plasmasphere and high-density plume regions. Early studies of the Earth's high energy radiation belt electrons showed that plasmaspheric hiss played a critical role in driving electron precipitation and loss into the dense upper atmosphere, and thus creating the familiar two-zone radiation belt structure. But the origin of the plasmaspheric hiss emission itself remained an open problem for many years and continues to be a hotly debated topic to the present day.

Prof. Thorne made seminal contributions to the discovery and characterization of plasmaspheric hiss using early satellite observations [1], he led the theoretical work in solving the two-zone structure of the Earth's radiation belts [2], and he worked on the origin of plasmaspheric hiss, essentially dispelling some of the common ideas proposed in the early 1970s and proposing some potential mechanisms [3], one of which – the so-called “chorus to hiss model” turned out to be very successful and has been developed further by the present author over the past 15 years [4,5].

In this presentation, we summarize some of the early work and contributions of Prof. Thorne in various aspects of plasmaspheric hiss studies (including characterization, effects on radiation belt electrons, and origins), we present some of the current research on the topic, and the author will conclude with a few stories and anecdotes about having fun and doing science with a friend, and mentor, and one of the greatest space physicists of the space age.

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4. Bortnik, J., R. M. Thorne, and N. P. Meredith (2008), The unexpected origin of plasmaspheric hiss from discrete chorus emissions, *Nature*, 452(7183), 62–66.

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