

A NEW APPROACH FOR INSTANTANEOUS IONOSPHERIC MAPPING IN THE COS271 REGION.

M. Pietrella, L. Perrone and G. De Franceschi

Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, 00143 Rome, Italy.

Abstract

An original technique is here presented for the regional ionospheric instantaneous mapping based on a set of foF2 instant measured values from a limited number of VI stations in the region of interest, superimposed to SWILM (Space Weighted Ionospheric Local Model), considered as the mean ionospheric reference field for the selected region and the selected epoch. The preliminary testing results carried out at middle and high latitudes and for high and low solar activity will be shown and discussed.

Introduction

In the frame of the European COST 271 (European Co-operation in the field of Scientific and Technical Research) project, an original technique is developed and here presented for a regional ionospheric instantaneous mapping of foF2. This approach is based on a set of foF2 instant measured values from a limited number of stations in the COST271 region (35-70N, 10W-60E) for quiet and disturbed periods as solar and geomagnetic storms. This technique is superimposed to SWILM (Space Weighted Ionospheric Local Model), that was developed for the regional long-term mapping and modeling of the plasma frequency of the F2 layer (De Franceschi *et al.*, 2000).

For the data analysis all the available monthly medians of foF2 from N stations in the COST 271 area and R_{12} index as indicator of the solar activity are considered as the database on which SWILM is building on. Two set of coefficients are calculated by least square fitting from the linear relations between the monthly medians of foF2 and the R_{12} . These set of coefficients are evaluated for each basic station, month of the year and time of the day. Then from these set of coefficients and for a given epoch the foF2 monthly medians can be predicted for each basic station. Finally the predicted value of monthly medians of foF2 at the point P for a given epoch is obtained weighting on the spatial scale the foF2 monthly medians obtained for the N stations (De Franceschi *et al.*, 2000).

Then the instant value of foF2 at the point P inside the COST 271 region could be obtained by considering the variations (Δ foF2) between the monthly median predicted by SWILM and the instant measured values of foF2 at $n=4$ stations. Δ foF2 is suitable weighted on a spatial scale.

For testing the performance of this instant model the numerical procedure is applied to some testing stations placed at low, middle and high latitude in the COST 271 area. The testing procedure consists in comparing measurements and predictions, using all the hourly data available, utilizing the *rms* error.

References

De Franceschi, G., L. Perrone and B. Zolesi: The Swilm approach for regional long-term modelling of middle/high latitude ionosphere, *Phys. Chem. Earth*, **25**, 343-346, 2000.