

ABSTRACT

Some applications of Wavelet Analysis to phenomena in the Ionosphere

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We apply wavelet analysis to analyze short-period geomagnetic field variations, ionospheric parameter variations, and IMF variations in quiet periods as well as during the manifestation of geomagnetic storms. The main idea is to observe some soliton type phenomena in the ionosphere in both stormy and quiet periods. In order to extract the “pure ionospheric effect”, one needs to analyze not only the ionospheric parameters, but also the incoming signal from the sun radiation (the data from the ACE satellite), and also the geomagnetic field measured at the geomagnetic observatories.

We have used data for different parameters of ionospheric plasma, however we have focused mainly on TEC. We use ionosphere sounding data from ground ionospheric stations, located near the ground geomagnetic field registration points. Thus we may compare the two signals and analyze them for possible correlation. Hence, we have the possibility of identifying the origin of individual modes (wave packages) and groups of modes. In particular, we use data from the ionosound station in Athens. The main trend of the signal is given by the daily variation of the TEC, however there are fast oscillations with periods less than 3 hours observed during the whole day. At midday time we observe modes (wave packages) with a larger amplitude which are apparently of soliton type. This phenomenon seems to be closely related to a soliton effect already observed and studied in [3], see also references therein.

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