



Statistical study of quasi-static electric field anomalies in the upper ionosphere related to seismic activity above different tectonic structures of the Earth

Mariyana Gousheva (1), Dimitar Danov (2), Plamen Hristov (3), and Margarita Matova (4)

(1) Space Research Institute, Bulgarian Academy of Sciences, 6 Moskovska Str., Sofia 1000, Bulgaria, (2) Solar-Terrestrial Influences Laboratory, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., bl3, Sofia 1113, Bulgaria, (3) Space Research Institute, Bulgarian Academy of Sciences, 6 Moskovska Str., Sofia 1000, Bulgaria, (4) Geological Institute, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., bl 24, Sofia 1113, Bulgaria

The satellite observation of vertical quasi-static electric fields allows the study of upper ionospheric anomalies that could be related to the seismic activity of different Earth tectonic structures. The quasi-static electric fields were recorded by IESP-1 instrument installed on the INTERCOSMOS-BULGARIA-1300 satellite. Forty eight orbits situated over Europe, Atlantic, North America, Central America, South America, Africa, Indian ocean, Asia, North Pacific, South Pacific, Australia, Arctic and Antarctic were chosen for the research when they pass above sources of 114 light, moderate or strong earthquakes. The time period of observation spanned between 17 August and 8 December 1981. The seismic data of earthquakes, their origin time, epicentre locations, magnitudes, depths and other details for this time period were obtained from United State Geological Survey (USGS) website. The main goal of this statistical study is to generalize the results about possible relationships between of the ionospheric quasi-static electric field anomalies and the seismic activity. The study proposes also evaluation of some peculiarities in the analyzed quasi-static electric field disturbances such as their appearance time before and after the main shock, amplitudes, sizes, forms and time duration.

Present research focuses on four main topics: (i) interrelations among the satellite information, the seismic data and the plate tectonic position of the earthquake sources, (ii) satellite observations of the quasi-static electric field in satellite's orbits above the sources of earthquakes with magnitude M 4.8-7.9 respectively 5-15 days before and 5-15 days after the seismic manifestations, (iii) summary of the statistical study and (iiii) conclusion. In case of small values of Kp index several observation results were used for a correlation analysis between the quasi-static electric field anomalies and the seismic activity. An exciting process of increase of about 2-10 mV/m in the vertical component of quasi-static electric field is noted above sources, situated on mobile structures of the plates. The observed effects are discussed in the paper. We propose arguments that the noted anomalies could be correlated with seismic manifestations and, some more, they could be included in the seismic prognostic investigations.