Geophysical Research Abstracts
Vol. 13, EGU2011-6669, 2011
EGU General Assembly 2011

Geomagnetic anomalies recorded at Muntele Rosu (Romania) seismic observatory and their statistical correlation with earthquake occurrence and solar magnetic storms

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NIEP has started to monitor the geomagnetic field in 1996 in only one location, situated at the edge of Vrancea seimogenic zone, named Muntele Rosu, MLR and related it to the intermediate depth seismicity. The system was a manual one, both in data transfer and processing. In July 2006, a complex monitoring system named MEMFIS was initiated and is providing information on acoustic, electric, magnetic and electromagnetic VLF/LF fields. The system is searching for the hidden correlations which could be established between the behavior of these fields and the preparatory stage of strong intermediate earthquakes in Vrancea zone.
It is important to point out that only a cumulating of data obtained by means of a more and more complete monitoring of the environment, as well as an adequate analyzing method may lead to the improvement of the prediction of earthquakes and to a more efficient civilian protection.
In the present paper we are trying to obtain a statistical cross-correlation between geomagnetic anomalies recorded at MLR station, earthquakes occurrence and solar magnetic storms. The working data are: (i) the geomagnetic field records made at Muntele Rosu Observatory (MLR), Surlari (SUA) and/or Tihany (THY) INTERMAGNET Observatories; (ii) the seismic data for Vrancea source zone, taken from the seismic bulletins of the National Institute for Earth Physics; (iii) the daily geomagnetic index from NOAA/Space Weather Prediction Center.
The whole geomagnetic data sets recorded between 1996 until present at MLR, SUA (or THY) were automatically corrected using a Lab View program developed especially for this purpose by the work team, emphasizing the missing or bad data. Missing data blocks were completed with the last good value. Geomagnetic data recorded at other observatories, as SUA and THY were also studied, in order to identify the global anomalies and to correlate them with the solar activity.
After the data correction we found some issues regarding the previous interpretation of the geomagnetic anomalies within Vrancea seismic zone, prior to some earthquakes. Some geomagnetic anomalies identified and presented as precursory signals proved to be induced either by an increased solar activity (as the Kp index demonstrates) or by malfunction of the data acquisition system, which produced inconsistent data, with numerous gaps. This work demonstrates that the reported precursory anomalies were insufficiently investigated, leading to some regrettable misinterpretations. According to our opinion, a more careful approach was needed and would be beneficial for such kind of statistical correlation studies.
Because some of the results presented in this paper rely on the data collected at Surlari Geomagnetic Observatory (Romania) and Tihany Geomagnetic Observatory (Hungary) we want to thank Geological Survey of Romania and Eotvos Lorand Geohysical Institute of Hungary (Hungarian Geological Survey), for supporting its operation and INTERMAGNET for promoting high standards of magnetic observatory practice (www.intermagnet.org).