Ionosonde and satellite data analysis in relation to the 2002 Molise (Italy) seismic sequence

Dario Sabbagh* (1), Loredana Perrone(1), Angelo De Santis(1), Saioa A. Campuzano(2), Gianfranco Cianchini(1), Dedalo Marchetti(3),(1), Martina Orlando(1) , Alessandro Piscini(1), and Maurizio Soldani(1)
(1) Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, 00143, Rome, Italy; e-mail: dario.sabbagh@ingv.it, loredana.perrone@ingv.it, angelo.desantis@ingv.it, gianfranco.cianchini@ingv.it, dedalo.marchetti@ingv.it, martina.orlando@ingv.it, alessandro.piscini@ingv.it, maurizio.soldani@ingv.it
(2) Instituto de Geociencias IGEO (CSIC-UCM), Ciudad Universitaria, 28040, Madrid, Spain; e-mail: saioa.arquero@igeo.ucm-csic.es
(2) College of Instrumentation and Electrical Engineering, Jilin University, 130061, Changchun, China; e-mail: dedalomarchetti@jlu.edu.cn

A combined ground-satellite study of the ionospheric response to the preparation phase of the seismic sequence occurred in Molise (Italy) in October and November 2002 [1] is here presented. Despite its moderate intensity, the first mainshock of this sequence, occurred on October 31st (10:33:00 UTC) with local magnitude equal to 5.4, destroyed several buildings in the town of S. Giuliano di Puglia and caused the death of 30 people, mostly children in a school. A second main event, followed by one-month long aftershocks sequence, occurred on November 1st (15:09:02 UTC) with local magnitude equal to 5.3. Ionospheric anomalies based on ionosonde observations of the altitude and blanketing frequency of the E-sporadic (Es) layer (h'Es and f_bEs, respectively) and of the critical frequency f_oF2 of the F2 layer are considered. For our analysis we make use of data from the Rome ionospheric observatory, looking for anomalies up to 2 months before the mainshocks occurrence, following the method previously applied to the M5.5+ earthquakes occurred in Central Italy since 1984 [2, 3]. Specifically, the variations for 2-3 hours of these parameters with respect to the past 27-day hourly running median are studied in relation to: (a) the ongoing geomagnetic activity during and several hours before the detection of the anomalies, as described by the values of the global a_p and the auroral AE geomagnetic indices; (b) the earlier-obtained empirical relations for the seismic-ionospheric disturbances relating the earthquake magnitude with the epicentral distance and the anticipation time of the found anomalies. In addition, ionospheric anomalies in the electron density measured over the earthquakes preparation region by the CHAllenging Minisatellite Payload (CHAMP) satellite at altitudes of about 400 km are studied in relation to the ionosonde-derived anomalies during the whole period preceding the mainshocks occurrence.

References

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