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Ionosonde and satellite data analysis in relation to the M5.9 April 6, 2009 L'Aquila (Italy) earthquake

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A combined ground-satellite study of the ionospheric response to the preparation phase of the M5.9 crustal earthquake occurred in L'Aquila (Italy) on April 6, 2009 is here presented. 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, located 90 km away from the earthquake epicentre, looking for anomalies up to a couple of months before the mainshock occurrence. 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 earthquake preparation region by the CHAllenging Minisatellite Payload (CHAMP) satellite at altitudes of about 320 km are studied in relation to the ionosonde-derived anomalies during the whole period preceding the mainshock occurrence.