

Earthquakes from space: examples of electromagnetic anomalies before large earthquakes detected by the ESA Swarm satellite mission

Angelo De Santis (1,2), Dedalo Marchetti (1), George Balasis (3), F. Javier Pavón-Carrasco (4), and Mioara Manda (5)

(1) INGV, Istituto Nazionale Geofisica e Vulcanologia, Roma, Italy (angelo.desantis@ingv.it), (2) G. D'Annunzio University, Chieti, Italy, (3) IAASARS, National Observatory of Athens, Athens, Greece, (4) Universidad Complutense de Madrid, Madrid, Spain, (5) Centre National d'Etudes Spatiales, Paris, France

We show here some case studies where we detect some pre-earthquake anomalous temporal patterns, likely due to a lithosphere-atmosphere-ionosphere coupling, in the magnetic and electron density signal recorded by the Swarm satellites prior to large M7+ earthquakes. Different techniques have been applied to Swarm data taken during two months around each earthquake occurrence. In particular, we show that in some cases the cumulative number of anomalies detected during night and magnetically quiet times follows the same typical power-law behavior of a critical system approaching its critical time, and hence recovers as the typical recovery phase after a large event. The similarity of this behavior with that obtained from seismic data analysis would support a lithospheric-linked origin of the observed magnetic anomalies. We suggest that the found pattern of anomalies might be connected to the preparation phase of large earthquakes.