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A multi-parametric climatological approach to study the preparatory phase of strong earthquakes

Dedalo Marchetti, Alessandro Piscini, Angelo De Santis, and Gianfranco Cianchini
Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy (dedalo.marchetti@ingv.it)

Based on observations prior to earthquakes, recent theoretical considerations suggest that some geophysical quantities reveal abnormal changes that anticipate moderate and strong earthquakes, within a defined spatial area (the so-called Dobrovolsky area) according to a Lithosphere-Atmosphere-Ionosphere coupling (LAIC) model. One of the possible pre-earthquake effects could be the appearance of some climatological anomalies in the epicentral region, weeks/months before the major earthquakes.
In a previous study an algorithm for searching of anomalies of the time series of climatological parameters by a statistical analysis was proposed and successfully applied to Amatrice-Norcia (Central Italy) earthquake sequence, which started on 24 August 2016. The simultaneous analysis of the climatological parameters related to the Amatrice-Norcia seismic sequence showed the presence of persistent contemporary anomalies in all of them.
An ESA-funded project, SAFE (Swarm for Earthquake study) and an ASI-funded project, LIMADOU were dedicated to investigate the LAIC from ground to satellite.
In this work most of the earthquakes considered in those projects, was analyzed in terms of climatological parameters. In particular, an approach based on the comparison of the historical time series and the year in which the earthquake occurred at the same seasonal time was applied. The analysis involves some land/atmospheric parameters collected from meteo/climate big data archive starting from a date preceding the mainshock by at least three months.
The simultaneous analysis of the different climatological parameters related to the strong world earthquakes showed the presence of contemporary anomalies in all of them, thus reinforcing the idea of considering such behaviour as an effective tool for an integrated system of future earthquake prediction.