Geophysical Research Abstracts
Vol. 18, EGU2016-18129, 2016
EGU General Assembly 2016

Hydrothermal anomalies before the 2009 Mw 6.3 L'Aquila earthquake in Italy referring to the geospheres coupling effects

Lixin Wu (1), Shuo Zheng (2), Kai Qin (1), Angelo De Santis (3), and Shanjun Liu (4)

(1) China University of Mining & Technology, Xuzhou, China, (2) Beijing Normal University, Beijing, China, (3) Istituto Nazionale di Geofisica e Vulcanologia,Rome, Italy, (4) Northeast University, Shenyang, China

A large number of precursory anomalies of the 2009 L'Aquila EQ were reported after the shocking, including thermal properties, electric and magnetic fields, gas emissions and seismicity. Previous studies on the seismic b-value are also insufficient, which is possibly a proxy of crust stress conditions and could therewith act as a crude stress-meter wherever seismicity is observed in lithosphere. Nevertheless, the reported anomalies have not been so far synergically analyzed to interpret or prove the potential coupling process among different geospheres. In this paper, the spatio-temporal evolution of several hydrothermal parameters related to the coversphere and atmosphere, including soil moisture, soil temperature, near-surface air temperature, and precipitable water, was comprehensively investigated. Air temperature and atmospheric aerosol were also statistically analyzed in time series with ground observations. An abnormal enhancement of aerosol occurred on March 30, 2009 and thus proved quasi-synchronous anomalies among the hydrothermal parameters from March 29 to 31 in particular places geo-related to tectonic thrusts and local topography. In additional, the three-dimensional (3D) visualization analysis of b-value revealed that regional stress accumulated to a high level, particularly in the L'Aquila basin and around regional large thrusts. This links logically and spatially the multiple observations on coversphere and atmosphere with that on lithosphere. Finally, the coupling effects of geospheres were discussed, and a conceptual LCA coupling mode was proposed to interpret the possible mechanisms of the multiple quasi-synchronous anomalies preceding the L'Aquila EQ. Results indicate that CO_2-rich fluids in deep crust might have played a significant role in the local LCA coupling process.