Multi-parameter satellite geochemistry for validation of atmospheric pre-earthquake signals associated with major seismicity. Case study for Xinjiang, China and Baja, California

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We are presenting the development of satellite geochemistry for multi-sensor validation of short-term atmospheric phenomena preceding major earthquakes. The purpose of this study is to explore the synergetic physical link between (1) satellite thermal infrared radiation (STIR) with anomalous distribution main trace gases :(2) Carbon dioxide (TCCO2), (3) Ozone (TCO3), (4) Methane (TCCH4) and (5) carbon monoxide (TCCO), associated with major seismicity. The science rationale for multidisciplinary analysis is based on concept Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) (Pulinets and Ouzounov, 2011), which is based on the gas emission from the lithosphere during the earthquake generation and explains the synergy of different processes and anomalous variations, usually named short-term pre-earthquake anomalies. We analyzed retrospectively several major earthquakes in two deferent seismo-tectonic regions: XinJiang province in China and in Baja, California including M7.2 of March 20, 2008 in China and M7.3 of April10, 2010 in Baja by systematically analyzing multi-sensor satellite atmospheric chemistry and ground temperature/ humidity observations. Meteorological satellite data include NOAA POES and AQUA/AIRS polar orbit satellites. In both cases satellite data shows (STIR, TCCO2, TCO3, TCCH4, TCCO) building atmospheric anomalies 1-20 days before the main shock. This probably is connected with enhances of the degassing rate of the lithosphere, which can provide additional source for flux emission near major faults in the area. The hourly in-situ atmospheric observation show similarly in the air temperature increases and drop in the relative humidity, probably as result of additional atmospheric ionization observed before the three earthquake events. Our initial results suggest that systematic use of multi-parameter satellite geochemistry can be used for additional physical validation of pre-seismic processes associated with the major earthquake events.

Keywords: earthquake precursor, forecasting, satelite, geochemistry, radon

