

# Learning new methodologies to deal with large disasters: Multisensor approach of analyzing atmospheric signals and search for possible earthquake precursors

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We present a possible relationship between tectonic stress, electro-chemical and thermodynamic processes in the Earth's crust and atmosphere with an increase in infrared flux as a potential signature of electromagnetic (EM) phenomena that are related to earthquake activity, either pre-, co- or post seismic. Using data from the polar orbiting MODIS onboard NASA's Terra and Aqua, AIRS ( on Aqua) and NOAA/AVHRR and geosynchronous weather satellites (GOES, METEOSAT) we have been analyzing surface emissivity, sea and land surface temperature, atmospheric optical depth, emitted earth radiation, air temperature and relative humidity.

Thermal infra-red (TIR) surveys gave an indication of the appearance (from days to weeks before the event) of "anomalous" space-time TIR transients that are associated with the location (epicenter and local tectonic structures) and time of a number of major earthquakes with  $M > 5$  and focal depths less than 50km. The possible cause for TIR anomalies is the electromagnetic coupling between the lithosphere and the boundary layer of the atmosphere before strong earthquakes due to an increase in tectonic activity and increased gases emanations which lead to plasma chemical reactions and to the increase of surface temperature. At satellite altitude the strength of TIR radiation emitted from Earth is strongly dependent on meteorological conditions and other factors independent from seismic activity. To provide a reliable discrimination of TIR signals that differ from natural phenomenon (seasonal changes, local morphology) a precise definition of "anomalous TIR" was established, and a statistical multi year time series analysis of TIR signals was implemented to reduce false detections.

As final results we present examples from the most recent (2000-2006) worldwide strong earthquakes and the techniques used to capture the tracks of the TIR anomalies and a methodology for practical future use of such phenomena in the early warning systems.