Land Surface Temperature (LST) as a part of Space based Multi-Parametric Approach for (Earthquake) Precursor Studies (S-MAPS)

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Abstract: Space-based observation of Land Surface Temperature (LST) as earthquake precursor has been attempted by many, however, it could not be used as a reliable tool due to lack of other supporting observations and a very plausible cause-effect relationship. Recent studies have shown that it is quite possible that one unified theory could explain the coupling of lithosphere-atmosphere-ionosphere, thus providing ample opportunity to test several hypothesis on earthquake precursor studies using LST, Very low frequency (VLF) wave propagation, Total Electron Content (TEC) of ionosphere, and Outgoing longwave radiation (OLR). In the present study, an attempt is made to detect anomalies using LST data prior to an impending earthquake. It has been hypothesised that there could be rise in temperature at many locations within a wide area around the epicentre prior to major earthquakes because of some chemical and mechanical processes such as Freund's peroxy defect theory and Earth Degassing theory. Using Terra MODIS Land Surface Temperature and Emissivity data product, some recent earthquakes from three different regions of the world have been studied. These include Peru-2019, Kermanshah (Iraq-Iran)-2017, and Kaikoura (New Zealand)-2016. Though land surface temperature may rise due to several other causes like weather and anthropogenic activities, average temperature rise of around 2°C-5°C for a continuous time period of 10 to 20 days with respect to previous years' average is considered as very significant observation prior to an earthquake. Other studies using TEC, VLF and OLR have revealed similar time window for earthquake precursor studies, thus providing credence to our observation prior to an earthquake.

Keywords: Earthquake precursor, thermal anomaly, land surface temperature (LST), Terra-MODIS