



Validation of EM Signals Associated with Major Earthquakes by Joint Analysis of Space and Terrestrial Data

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Ground and space observations have shown that there were precursory electromagnetic signals associated with several recent earthquakes. The goals of this work are: (1) to identify the common methodology for statistical validation of the major EQ precursory phenomena; and (2) to cross-examine these results of precursory detection for several major earthquakes by using different methodologies. Our approach is based on data fusion of satellite thermal infrared observations from Aqua, GOES, POES and space plasma parameters variations from DEMETER, simultaneously with ground based multi parameter continuous measurements of GPS/TEC, ion concentration, atmospheric electrical field and magnetic array. We used existing satellite sensors and ground observations and linked them together with the Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) model. This model describes a physical coupling between the boundary layer of atmosphere and the ionosphere with the observed ground and space data prior to some major earthquakes. The significance of joint satellite and ground based EM precursors search was defined by cross validating with different techniques the precursory phenomena around the time of four more recent major earthquakes: (1) M 9.3 Sumatra (Indonesia) 2004.12.26; (2) M7.0 Ping Tong (Taiwan) 2006.12.24; (3) M6.8 Chuetsu Oki (Japan) 2007.7.16; and (4) M7.9 Wenchuan (China) 2008.5.12.

Our first results show that simultaneous satellite and ground measurements, using the integrated web, can help to understand better the pre-earthquake processes and provides opportunity for global scale monitoring framework by combining multiple sensor sources.