Prospective validation of physical-based precursors and their potential for short-term earthquake forecasting. Case study for Japan 2014-2016

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We are presenting a prospective validation of short-term pre-earthquake phenomena preceding major earthquakes. Our challenge question is: "Whether such physical-based signals are significant and could be used for early warning of large earthquakes?" To address this question we have started continuous validation of atmospheric signals in retrospective/ prospective modes over Japan. Our approach is based on multidisciplinary analysis of several physical and environmental parameters (Satellite transient infrared radiation (STIR), electron concentration in the ionosphere (GPS/TEC), radon/ion activities, air temperature and seismicity patterns) that were found to be associated with earthquakes. The science rationale for multidisciplinary analysis is based on concept Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) (Pulinets and Ouzounov, 2011]), which explains the synergy of different processes and anomalous variations, usually named short-term pre-earthquake anomalies.
Our validation processes consist in two steps: (1) A continuous retrospective analysis preformed over two different regions with high seismicity- Taiwan and Japan for 2003-2011 (2) Prospective testing with potential for M6.5+ events Japan for 2014-2015 period. The test results suggest appearance of physical pre-earthquakes anomalies, one to several days in advance to major events, including the largest earthquakes - M7.8 of 30 May 2015 and all other M6.5+ for that period. The false alarm ratio for the testing period has shown false positives less then 20%. Our initial prospective tests show that multi-parameter analysis could reveal short-term pre-earthquake anomalies prior to the largest earthquakes in Japan.

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