

THERMAL ANOMALIES AND SEA SURFACE HEIGHT CHANGES ASSOCIATED WITH THE SUMATERA EARTHQUAKES OF FEBRUARY 2008

Shattri Mansor and Habibeh Valizadeh Alvan

Department of Civil Engineering, University Putra Malaysia, Serdang, Selangor, Malaysia

shattri@upm.edu.my; shattri@eng.upm.edu.my

ABSTRACT :

The emergence of remotely-sensing devices has made it possible to monitor changes on and above the earth's surface in wide scales. Multi-spectral images, radar data, thermal sensors, and meteorological satellites provide a huge help for scientists to have better understanding on the phenomena and its surrounding. Different data providers have eased the produce-to-use line with their good quality, validated, free and publicly-available datasets. Geophysicists developed theories about the earthquake mechanisms and the underground geophysical and geochemical interactions involved in the process of ground shakes, and the related phenomena that might be detected as pre-earthquake signals. Earthquakes are triggered when the energy accumulated in rocks releases causing ruptures in place of faults. Elastic strain in rocks, formation of micro-cracks, gas releases and other chemical or physical activities in the earth's crust before and during earthquakes has been reported to cause rises in sea surface temperature (SST), surface latent heat flux (SLHF), and sea surface height (SSH). This study examines variations of these three factors before past oceanic major earthquakes in Sumatra, Indonesia. Our detailed analysis revealed 1–3°C rises in sea surface temperature in epicentral areas. Significant rises in SLHF from one month to days before the main events may lead us to understand the energy exchange mechanism during the earthquakes and at the period of aftershocks. These anomalies prior to impending earthquakes can be attributed to degassing and ionization processes activated by the accumulated stress in the rocks especially along faults. Our data analysis also revealed rises in sea surface height along the nearby fault zone in case of both earthquakes of Indonesia. The anomalous patterns started developing two weeks to a few days before the earthquakes and disappeared after the main shocks.

Keywords : earthquakes, thermal anomalies, sea surface height, surface latent heat flux, natural hazards