The Sumatra-Andaman Earthquake driven Sea Surface Temperature and Wind Anomalies

S. C. Chakravarty

Indian Space Research Organisation (ISRO) Headquarters, Antariksh Bhavan, New BEL Road, Bangalore, India 560094

Two large earthquakes occurred over the fault boundary between the Indo-Australian and south eastern Eurasian plates on December 26, 2004 and on March 28, 2005 with seismic moment magnitudes of about 9.3 and 8.6 respectively. The first event ruptured at least 1200 km long portion of the fault with fault slip of about 15 m below Sumatra coastal seabed and smaller slip along the Andaman and Nicobar Islands. The first event generated strong tsunami waves but the second produced only a very weak one.

Sea Surface Temperature (SST) and Sea Surface Wind (SSW) anomalies are observed in AQUA satellite data spanning the oceanic surface over the hypocenter (3.316˚N, 95.854˚E) of the Sumatra-Andaman earthquake of 26 December 2004. The average values of temperature deviations for the 14˚x13.5˚ lat-long grid surrounding the approximate oceanic epicentre is found to be about -0.5˚ C with the anomaly gradually building up 5-6 days in advance reaching the peak around the event day and decaying thereafter in 2-3 days time. Corresponding maximum deviations in SSW speeds for individual pixels is found to be $\sim$4-5 m/s. Such clear signals of SST and SSW variations have not been observed for the second Sumatra earthquake of 28 March 2005, which occurred near the same hypocentre but did not produce severe tsunami waves like the first one. The cooling of SST is interpreted as due to mixing of cold water in the vertical column from the erthquake hypocentre and associated region of the fault area. The colder water moving up from below and spreading laterally over a large ocean surface area could produce such cooling effects. The initiation of the cooling observed even before the main event of 26 December 2004 indicates efficiency of vertical mixing due to pre-earthquake energetics, which could provide possible prediction of impending generation of tsunami waves once such earthquakes take place below the sea bed. Modelling results show similarities with these observed anomalous features.