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CHAMP satellite observations during recent destructive megathrust earthquakes

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On December 26, 2004 the world's fourth largest earthquake since 1900 and the largest since the 1964 Prince William Sound, Alaska earthquake, occurred off the west coast of northern Sumatra with a magnitude of 9.3. On March 28, 2005 another event of magnitude 8.7 took place in the same region. The December 26, 2004 earthquake has prompted scientists to investigate possible electromagnetic signatures of this event, using ground magnetic observations. Iyemori et al. (2005) have suggested that a 3.6 min long geomagnetic pulsation, observed shortly after this event, was generated by the earthquake. They have speculated that a 30 s magnetic pulsation was also caused by the earthquake. Here for the first time, CHAMP satellite magnetic and electron density data are examined to find out if electromagnetic signatures which are possibly related to these recent megathrust earthquakes are observed in satellite magnetic data. We have shown that some specific features are observed after the two earthquakes, with periods of about 16 and 30 s. Our results favor an external source origin for the 30 s pulsation. Moreover, after more than 1 h, CHAMP magnetic data indicate the existence of a feature characterized by the same parameters (duration, amplitude, and frequency content), which could be associated with each earthquake, respectively. Further investigations are required in order to answer the question of whether these signals can be associated with earthquakes and to assign their possible usefulness with respect to earthquake development.