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Tsunami related to solar and geomagnetic activity

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The authors of this study wanted to verify the existence of a correlation between earthquakes of high intensity capable of generating tsunami and variations of solar and Earth's geomagnetic activity. To confirming or not the presence of this kind of correlation, the authors analyzed the conditions of Spaceweather "near Earth" and the characteristics of the Earth's geomagnetic field in the hours that preceded the four earthquakes of high intensity that have generated tsunamis: 1) Japan M9 earthquake occurred on March 11, 2011 at 05:46 UTC; 2) Japan M7.1 earthquake occurred on October 25, 2013 at 17:10 UTC; 3) Chile M8.2 earthquake occurred on April 1, 2014 at 23:46 UTC; 4) Chile M8.3 earthquake occurred on September 16, 2015 at 22:54 UTC. The data relating to the four earthquakes were provided by the United States Geological Survey (USGS). The data on ion density used to realize the correlation study are represented by: solar wind ion density variation detected by ACE (Advanced Composition Explorer) Satellite, in orbit near the L1 Lagrange point, at 1.5 million of km from Earth, in direction of the Sun. The instrument used to perform the measurement of the solar wind ion density is the Electron, Proton, and Alpha Monitor (EPAM) instrument, equipped on the ACE Satellite.
To conduct the study, the authors have taken in consideration the variation of the solar wind protons density of three different energy fractions: differential proton flux 1060-1900 keV (p/cm^2-sec-ster-MeV); differential proton flux 761-1220 keV (p/cm^2-sec-ster-MeV); differential proton flux 310-580 keV (p/cm^2-sec-ster-MeV). Geomagnetic activity data were provided by Tromsø Geomagnetic Observatory (TGO), Norway; by Scoresbysund Geomagnetic Observatory (SCO), Greenland, Denmark and by Space Weather Prediction Center of Pushkov Institute of terrestrial magnetism, ionosphere and radio wave propagation (IZMIRAN), Troitsk, Moscow Region. The results of the study, in agreement with what already ascertained by authors from 2012, have confirmed that the four strongest earthquakes (and then the four tsunami) were preceded by a clear increase of the solar wind proton density which subsequently generated perturbation of the Earth's geomagnetic field. The temporal characteristics of the proton increases and geomagnetic disturbances that preceded the four tsunami have a clear predictive significance especially in the face of recent studies on Seismic Solar Precursors (SSPs), on Interplanetary Seismic Precursors (ISPs) and on Seismic Geomagnetic Precursors (SGPs) presented by the authors in the last two years.