



Possible relationship between changes in IMF, M7+ earthquakes and VEI index, during the transition between the solar minimum cycle 23 and the rise of solar cycle 24

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Numerous scientific papers seem to suggest a possible influence of solar activity on geological dynamics (hypothesis triggers earthquakes or volcanic activity) on Earth. In the following study, all earthquakes around the globe with a magnitude greater than or equal to 7, from January 2010 to November 2012, were taken into account which corresponds to the appearance of the first sunspot of Solar Cycle SC24. The data was then compared with the graph that shows the variations of the interplanetary magnetic field (IMF). This second track is the result of a moving average equal to 27 (solar rotation of Bartel) starting from the daily values of the field, detected by the magnetometer on board the probe Advanced Composition Explorer (ACE). The analysis reveals a first major change in February 2010, when the IMF changes from 4.5 nT to about 5.8 nT. A second identical significant change is found in February 2011, when the IMF, went from 4.5 nT to about 5.8 nT. In March 2012, we have, the other way around, a third important change in the IMF, with later's dynamics registering a variation from 5.6 nT to about 6.8 nT.

We find that the three most important seismic events of the last three years (M8.8 in Chile 27/02/2010; M9 in Japan on 11/03/2011, and M8.6 on 11/04/2012 in Sumatra) occurred at the same time or slightly after the peaks (Bmax) of increase in the magnetic field of the heliosphere "facing the Earth" were reached.

The analysis also suggests further connections between earthquakes with $M > 7$ and when the peak (maximum value the IMF) were reached, recorded in other changes in the field in these three years. Like, for example, the earthquake of M7.5 in India of 12/06/2010, when the IMF increased from 4.5 nT to 5.2 nT, or the earthquake in Sumatra 25/10/2010, when the IMF went from 4.4 nT to 5.1 nT. The variation of the IMF, recorded in May 2011, from 4.7 nT to 5.9 nT, relates, for example, not only with the M7.6 earthquake in Kermadec (07/06/2011), but also with volcanic eruptions of Puyenne Cordon Caulle in Chile (05/06/2011) VEI4, of Grimsvotn in Iceland (21/05/2011) and of the Nabro in Eritrea (12/06/2010). The other two most significant eruptions in the last three years are that of Eyjafjallajokull (VEI4) in Iceland 20/03/2010 and of Merapi (VEI4) in Indonesia on 25/10/2010. Events which are also to be connected to further variations of the IMF, of February 2010 and October 2010. The graphics elaborated in this study also show, further connections between the changes of the planetary magnetic field and M7+ seismic events.

We conclude that this research further confirms that while coming out from periods of low activity, in the long period - deep solar minima, and the simultaneous fast oscillation, in the short period and impulsive electromagnetic activity, the recovery of the EM activity of the Sun can trigger significant geophysical events in terms of energy release as regards the magnitude or the VEI index.