Traveling Ionospheric Disturbances observed over South-America after lithospheric events: 2010 – 2020

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Abstract: During the last decade, a significant increase in ionospheric observations in South America has been achieved. This is due to the increase in Global Navigation Satellite System (GNSS) network receivers in the region. GNSS observations allow to, indirectly, determine the Total Electron Content (TEC) and to generate TEC maps of unprecedented temporal and spatial resolution. Such resolution makes it possible to identify Traveling Ionospheric Disturbances (TIDs) generated after lithospheric phenomena (such as earthquakes and volcanic eruptions). Disturbances of 3 types can be observed: TIDs generated by the shock-acoustic wave (TID_{SA}, 500-1500 m/s), TIDs generated by gravity waves possibly induced by tsunami waves (TID_{GW}, 200-300 m/s), and TIDs generated by Rayleigh surface waves (TID_{RS} 2000-4000 m/s). In this work earthquakes (Mw≥6.7), tsunamis and volcano eruptions observed in South-America between 2010 and 2020 were thoroughly analyzed. Out of a total of 63 events of earthquakes, in 10 cases (16%) the TIDs were observed. Out of a total of 8 events of volcano eruptions, only in 2 cases (25%) the TIDs was observed. Of all these events, 12 TID_{SA}, 3 TID_{GW} and 1 TID_{RS} were visualized. This work attempts to identify some type of correlation between the wave characteristics (e.g. direction, amplitude, speed, range, etc) of these TIDs and the main seismic source features (e.g. moment magnitude, depth, fault mechanism) of the events. Confirming previous results, we find that shallow earthquakes which are compatible with noticeable vertical surface displacements, appear to be more efficient to generate TIDs.

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