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Detection of Traveling Ionospheric Disturbances from an Earthquake and a Volcano Eruption: Case Study

Literatures introduced Ionospheric responses to earthquakes and volcanic eruptions in several decades. These events induce the Traveling ionospheric disturbances (TIDs) which can be detected by monitoring the temporal and spatial variation of electron content in the ionosphere. On 23 January 2018, multiple geophysical events along the ring of fire were reported. Although a few studies revealed there was no strong correlation between the events, it is still worth to observe the ionospheric reaction from those events for comparison. In this study, we selected 7.9 Mw earthquake in Gulf of Alaska and Kusatsu-Shiranesan volcanic eruption in Japan as a case study. Analyzing the waveforms of TIDs generated from two types of events with the same space weather condition (as they were happened on the same day) provides the results of less uncertainty due to the external conditions. The TIDs were extracted and detected from GNSS carrier phase observations recorded at nearby GNSS stations of each event. By a coherent analysis, a notable similarity and dissimilarity among the TIDs from two events were revealed. This study suggests the effective approach to discriminate the signatures of ionosphere from a specific type of the earth geophysical event.

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