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Verification of the U.S. Underground Nuclear Explosions of 1992 Using GPS: Case Study

We collected the Global Positioning System (GPS) data available in the International GNSS Service database for the days corresponding to two of the U.S. underground nuclear tests that is the Hunters Trophy and Divider, carried out in 1992 at the Nevada Test Site (NTS) and Yucca Flat, respectively. Each total electron content (TEC) of all possible ray paths between the GPS stations and the available satellites was extracted, then, we applied the numerical derivative method to compute slant TEC (STEC) derivatives. From the continuous STEC derivative data spans, the traveling ionospheric disturbances (TIDs) were isolated. These TIDs of two UNEs consisted their own array signatures in terms of the constant propagation velocity of the TID induced by specific event. The approximate propagation velocity from the Hunters Trophy was about 573.00 m/s, which was supported by another independent verification from an astronomical radio telescope, the Very Large Array (VLA) in New Mexico that was about 570-710 m/s. In addition, the TID propagation velocity of the Divider was 739.76 m/s. This study suggests that the global availability of GNSS tracking networks with algorithmic improvement of this method may offer a future UNE detection method, which could complement the International Monitoring System (IMS).

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Track Classification: Theme 2: Events and Their Characterization