Since the 1960s, the connection between seismic activity and the variability in the Earth's ionosphere has had much research attention. In particular, many researchers have identified what are believed to be significant abnormalities in the peak plasma density of the ionospheric F2 layer 3-5 days prior to large seismic events. In addition, significant gravity wave and Alven (magnetospheric) wave activity has also been observed following the earthquakes. There are obvious advantages in using the ionospheric variability to forecast severe earthquakes, however the task of separating the ionospheric phenomena related to other sources, such as geomagnetic activity and particle precipitation, from those apparently due to seismic activity is rather complicated. In this paper, a relatively new space-based method of measuring the ionospheric plasma density profiles at multiple locations is employed to study the state of the ionosphere prior to, during and after the recent major seismic events around the Pacific Rim. The ionospheric plasma density profiles were obtained by the Constellation Observing System Meteorology Atmosphere and Climate (COSMIC)/FORMOSAT-3 spacecraft using the method of Radio Occultation and are supported by ground-based observations and the latest atmospheric and ionospheric modelling. The ionospheric variabilities found during these periods are investigated and the potential of using ionospheric observations to reliably predict the occurrence of severe seismic events is discussed.