

# Senior Design Presentation

Joe Hammerstrom

## TEC Data Variations & Correlation with Seismic Activity over Japan

Earthquake detection is an area of science that is not yet fully understood. The investigation in this project of the Japan earthquake will help develop a tool to potentially detect fatal earthquakes in the long term. The investigation will use Total Electron Content (TEC) data from Japan and current knowledge of the Japan earthquake to determine whether there is a correlation between earthquakes and TEC activity. The investigation of TEC activity near the time of earthquakes could also allow developing an earthquake warning system that could be useful for preventing lost of lives and devastation specifically in urban areas. The key concept behind this investigation is TEC. Japan TEC is the line integral of the electron density (typically considered to be the number of electrons in a spherical tube 90 to 1200 km above the earth's surface) along a path between a GPS satellite in orbit and a receiver on the ground [Tsugawi et al., 2011]. Based on result from current research, TEC can be very important when we consider the fact that pre-seismic activities might create electrical current (from stress on rocks). These electric currents might cause electrons to travel to the ionosphere [Friedmann, 2010]. There are other works in the area of earthquake prediction using TEC. One study focused on how gravity waves affected the TEC during an earthquake and tsunami. The study found that the TEC data matched the speed and location of the tsunami, [A. Galvan et al., 2012]. Other studies have found that the TEC followed the ionosphere density fluctuation patterns after the onset of an earthquake [Kosuke Heki, 2011]. Our investigation will be restricted to studying the correlation between TEC and seismic activities before and after the earthquake in Japan.

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