Senior Design Presentation

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Analyzing Anomalies in the Ionosphere above Haiti Surrounding the 2010 Earthquake

Pre-seismic electric fields cause electrons to penetrate into lower layers of the ionosphere and to travel to the higher layers, creating anomalies in all of the ionospheric layers [**Park and Dejnakarintra, 1973].** However, the ionosphere is regularly perturbed by solar and geomagnetic effects, which make it difficult to extract ionospheric variations connected with earthquakes [**Sharma et al., 2008]**. Several researchers have developed contending theories on the mechanism associated with pre-earthquake signals. The basic premise is that a thin layer of particles created before earthquakes due to ions originating from the earth's crust travel to the earth's surface and begin radiating from the earth's surface due to strong electric fields [**Namgaladze et al., 2009]**. The ions can then travel from above the earth's atmosphere to the ionosphere. When solar and geomagnetic disturbances can be ruled out, the effects of pre-seismic activities in the ionosphere can be assessed using fluctuations in the ionospheric electron density. The Parameterized Ionospheric Model (PIM) is a fast global ionospheric model which produces electron density profiles (EDPs) between 90 and 25000 km altitude, which corresponds to critical altitudes of the ionosphere [**Daniell et al., 1995]**. Since PIM only simulates a statistical mean ionosphere, sudden variations in ionospheric electron density will not be represented in the model, which makes PIM ideal for background electron density predictions. In this project, we contrast the background ionospheric density PIM predictions for tectonically active regions over Haiti with density data predicted by the Detection of Electromagnetic Emissions transmitted from Earthquake Regions (DEMETER) satellite data. The ultimate goal of this project is to isolate/separate background PIM electron density predictions from the fluctuation in the measured DEMETER electron density data. Such separation could create means for assessing and predicting the potential content and variations of pre-seismic electron density.

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