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Session 4B Paper 2

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Preliminary results from a small scale travelling ionospheric disturbance (TID) network deployed near Arecibo as part of the Heating EXperiment (HEX)

The ionosphere is subject to many solar and terrestrial influences that can generate disturbances and degrade modern communication and navigational systems. Whilst the disturbances are normally caused by natural phenomena such as hurricanes, earthquakes and solar storms they can also be generated by artificially modifying the ionosphere.

Artificial Ionospheric Modification (AIM) attempts to alter a small region of the ionosphere in order to alter the RF propagation environment. This can be achieved through injecting the ionosphere with aerosols, chemicals or radio signals. The effects of any such modification can be detected through the deployment of sensors, including ground based high frequency (HF) sounders and dual-band Global Positioning System (GPS) receivers. The latter offer a convenient means of obtaining information about the ionosphere, including ionospheric disturbances through changes in the derived Total Electron Content (TEC) information.

The Heating EXperiment (HEX), scheduled to take place in March 2017, was designed to help further our understanding of the phenomena caused by artificially heating the ionosphere, using the Arecibo facility in Puerto Rico. This was achieved by utilizing a HF measurement experiment spread over 3500 km and the deployment of a small scale travelling ionospheric disturbance (TID) network near the heater. The deployed network comprised three GPS receivers along baselines of approximately 4 km, located 20 km north of the heater.

Applying a previously tested approach based on ideas from Synthetic Aperture Radar (SAR) the recorded GPS data will be used to detect TIDs and estimate their velocities in order to help disentangle the naturally occurring TIDs from those generated by the heater. This paper presents preliminary results from the TID network deployed during the HEX campaign.