

## OBSERVATION OF ACOUSTIC WAVES AND OTHER TRANSIENT DISTURBANCES USING VIPIR IONOSONDE.

### Abstract:

Ionosondes typically make several observations at a given frequency once every several minutes. A typical configuration used by the Vertically Incident Pulsed Ionospheric Radar (VIPIR) located at Wallops Flight Facility (WFF) would be an eight pulse set every two minutes with a pulse repetition of ten milliseconds. This method provides a snapshot of the observed plasma including location and velocity. We leverage this capability by programming the VIPIR to make observations at one or more frequencies continuously. This method reduces the temporal resolution from a few minutes to a fraction of a second allowing the evolution of transient disturbances can be monitored.

### Summary:

The VIPIR ionosonde is a radar system that has the capability to track ionospheric plasmas as they pass through the instrument field of view. By modifying the frequency tables, we are able to configure the VIPIR to make continuous observations of Travelling Ionospheric Disturbances (TID), transient disturbances and other plasma structures.

Examples of experimental campaigns we have conducted using this method include tracking of acoustic waves generated by rockets, tracking of plasma response to meteorite ablation, tracking of plasmas induced by rocket exhaust, and observation of ionospheric response during a hurricane.

The methods we use are being improved and updated with each new experimental campaign, and we have plans to develop algorithms that can initiate observation during extreme events including earthquakes, tsunami's, volcanic eruptions and nuclear weapons testing.