

Tracking Space Weather Using Shipping Radio Signals

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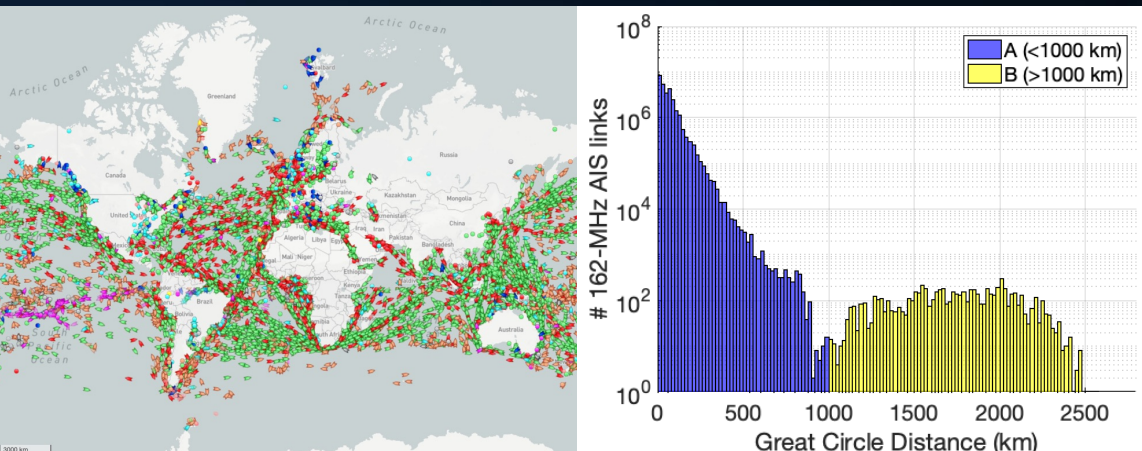
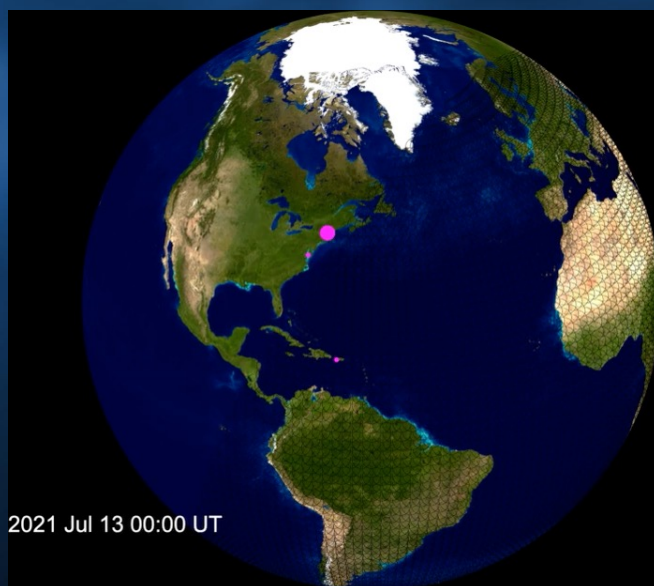


Figure 1: AIS transmitters are mandated for continuous use on all large ships. USCG receivers identified **anomalous links** coming from ships >1000 km away.

Figure 2: **Ionosonde stations** in MA, VA and PR indicate extremely high levels of sporadic E associated with these anomalous radio links. Saturated ionosonde measurements are shown in **white**.



Ubiquitous shipping information signals provide a means of identifying dense plasmas in the lower ionosphere

- Earth's ionosphere occasionally forms extremely dense and thin/narrow layers due to meteor ablation, windshears and other phenomena. These layers are hard to observe and therefore poorly understood, but could be a useful tracer of system dynamics.
- A USCG network on the east coast received >29 million signals over 3 days, of which **6677 came from >1000 km away** (Figure 1).
- Our findings indicate sporadic E layers are the cause of this anomalous propagation, and that **these layers may reach densities >10x higher than previously thought** (10^{13} el. m^{-3} or more)