Tracking Space Weather Using Shipping Radio Signals
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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)

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.