Sudden Ionospheric Disturbance (SID) Event Observed on NAA, NLK, and NAU on 3/2/2022

A Sudden Ionospheric Disturbance (SID) event was observed on three Navy VLF transmitters at the Springbrook Township, PA US location. This is caused by solar flares or gamma ray bursts. The propagation is enhanced due to the sudden ionization density. At VLF frequencies, this perturbation causes a sudden enhancement in propagation, usually within the time span of an hour. At HF, SIDs cause a diminishing of propagation. Gamma Ray Bursts (GRBs) from distant, extragalactic sources can also create an increase in ionization density at VLF frequencies. This SIDs are in constant excitation due to worldwide propagation.

Possible Ionospheric Perturbation and Sudden Enhancement of Atmospherics (SEA) Event Caused by the 1/15/2022 Tonga Eruption

In this plot of NAA above captured at Grimeton, Sweden, at a frequency of 17.2 kHz. A QSO at Springbrook Township, PA, US was possible with the VLF reception system using signal processing. On the top-right, a 200 kHz spectrum plot integrated over the duration of the whole transmission showing the power spectrum and a signal peak at ~17.150 kHz. Even with a peak of 3µ relative amplitudes above the noise floor, audible CW was able to be copied! Assuming a transmitter power of 310 kW ERP based on UWPC modeling using a calibrated receiver at another location, it was estimated from UWPC modeling that received field strength at the antenna was 22 µV/m with VLF background noise at 8 µV/m. After capturing, the spectrum was brick wall bandpass filtered, centered at the transmission frequency of 17.2 MHz and 1000 Hz wide, then downsampled to 500 Hz for audibly processing. It was then fed through a Butterworth bandpass filter 20 Hz wide that made copying even easier. There was observed fading, but some of the message was able to be decoded. On the upper right image, a QSL card from the Alexanderson Association confirming QSO of the 15th January 2022.

In this plot of NAA captured at Fife, Scotland by Peter Newton GM0EZR, the same reduction in amplitude can be observed at the same time.