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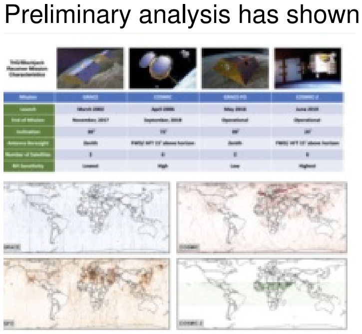
Poster
GNSS is a critical global infrastructure with a wide range of commercial, military, and science applications. Recent studies have identified potential threats to the performance of GNSS from both intended and unintended sources of radio frequency interference (RFI). Understanding the distribution of these sources of RFI and the nature of the signals they are emitting is critical to determining their effects on the measurements made by GNSS receivers. Analyses using of data from spaceborne GNSS receivers have been developed to detect, locate, and characterize terrestrial RFI.

JPL's Blackjack/TriG GNSS receivers are currently in use for precise-orbit determination and radio occultation measurements on 9 spacecraft, with 3 more being launched by 2025. With a 20-year data record from past missions, these receivers have created an extensive database of measurements spanning most of the Earth's surface. With these data, we have discovered that terrestrial RFI is not only detectable from these receivers, but is often substantially detrimental to the received signals. In addition to reducing the overall signal-to-noise ratio (SNR) of the direct and occulting signals, the interference can create scintillation effects that trigger automated processes on the receiver into modes which record ionospheric scintillation. This could have implications for the interpretation of related science measurements. The majority of these signals likely come from jammer/spoofer systems, both known and unknown.

Using the extensive set of measurements from GRACE, COSMIC, GRACE-FO, and COSMIC-2, we have performed an initial analysis of this RFI. This is implemented by looking at degradation to the voltage SNR values recorded by these receivers with a filtering/cross-correlation technique that has proven highly sensitive to various forms of RFI. This initial work has focused on simply the detection of the presence of RFI, and uses the receiver's orbital solution to record the location of detection events. With this minimal amount of information, an inter-mission analysis creates a unique record of global RFI with the potential for a) rigorously identifying the presence of interfering signals during science measurements, b) geolocating the transmitters of this RFI, and c) characterizing the nature of the transmitted signal to better identify intent. Preliminary analysis has shown correlation with regional conflicts and other geopolitics events.



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