

# GEOSYNCHRONOUS RADIO OCCULTATION PROCESSING WITH GOES

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We present processing strategies and results for ionospheric radio occultation (RO) retrievals from the NOAA/NASA GOES-16 and GOES-17 GPS navigation receivers. These are the first published RO retrievals from a geosynchronous GNSS receiver.

Radio occultation from geosynchronous orbit holds the potential to provide unique temporal and spatial atmospheric measurements not possible from ground and low earth orbit space-based receivers, including new observations of the upper ionosphere. Notably, the GOES geosynchronous satellites provide an “eye in the sky” pattern of Earth coverage, which can potentially achieve predictable twice-a-day observations at roughly the same location for each of the GPS constellation satellites orbiting below it.

Details of the processing at UCAR are presented. Challenges which had to be overcome include:

1. Poor geometry for orbit determination and tracking compared with LEO
2. Single frequency, GPS-only receiver
3. Extremely high rate of clock drift on the receiver with frequent noisy clock corrections

Several strategies for dealing with the high clock rate are discussed, including a novel approach using a consensus of multiple reference satellites. Comparisons of individual profiles with the IRI ionospheric model and COSMIC-2 retrievals are shown, as are statistical comparisons with IRI.