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Probing the Ionosphere with the Radioscience Instruments on CASSIOPE/e-POP

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Two major themes in the ePOP ionospheric radioscience plan are the structure and dynamics of the three-dimensional distribution of density and plasma-wave processes. The e-POP wave instruments involved are the GPS Attitude, Position and Profiling (GAP) instrument, the Coherent Electromagnetic Radiation Tomography (CERTO) beacon, and the Radio Receiver Instrument (RRI)

The e-POP radioscience agenda exploits opportunities for observations coordinated both with other instruments aboard CASSIOPE and with ground observatories and other ionosphere-thermosphere spacecraft. The GAP receives signals from the Global Positioning System (GPS) satellites for studies of ionospheric structure. When combined with data from earth-based GPS receivers, these measurements are used to improve ionospheric tomography. CERTO transmits at VHF and UHF for detection by dedicated receivers on the ground, for similar purposes of two- or three-dimensional imaging of density structure and for investigation of scattering by ionospheric irregularities. RRI is a four-channel digital receiver for recording the electric fields of waves between 10 Hz and 18 MHz. Collaborative studies using transionospheric HF propagation are under way for imaging mesoscale structures near the peak of the F-region, through the reception of waves from ionosondes, coherent backscatter radars or other HF transmitters. The structure thus observed can be compared with the results of ionospheric tomography from CERTO and GAP.

Electromagnetic phenomena of spontaneous origin are investigated in collaborations involving the RRI and ground-based receivers of space emissions. Propagation at frequencies from ELF to HF are studied to understand access to the magnetosphere of manmade signals and access to the ground of spontaneous noise from space.

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