James
Cannon
University of Colorado Boulder, Department of Aerospace Engineering Sciences
Robert Marshall, University of Colorado Boulder, Department of Aerospace Engineering Sciences
Poster
The Earth’s ionosphere is classically broken into 3 distinct regions: the D-region (50-90 km), the E-region (90-150 km), and the F-region (150-500 km). Radio signals propagating through the ionosphere can, depending on frequency, become attenuated and refracted based on the altitudinal electron density profile. High Frequency (HF, 3-30 MHz) and Very High Frequency (VHF, 30-300 MHz) radio bands used in airline communication refract through the D-region plasma to establish a link. Substantial changes to D-region electron density as a result of space weather effects like solar flares can induce a radio blackout, especially in the HF frequency band. High-energy particle precipitation from Earth’s radiation belts can create localized regions of increased electron density. Measuring these local patches of increased electron density is challenging given the altitude range of the D-region. To accomplish this task, we present AVID, the Array for VLF Imaging of the D-region. AVID covers a region ~1500 km x ~2500 km and tracks 22 overlapping Very Low Frequency (VLF, 3-30 kHz) transmit-receive paths. These VLF radio waves efficiently reflect off the D-region plasma and propagate for 1000s of kilometers allowing a long-range probe into the D-region. To untangle spatial dynamics in the D-region, a data assimilation technique called a local ensemble transform Kalman filter (LETKF) is presented, including a discussion on simultaneous estimates of the “state” (ionosphere) and systematic biases.
Poster session day
Tuesday, April 28, 2026
Poster location
1
Meeting homepage
2026 Space Weather Workshop
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