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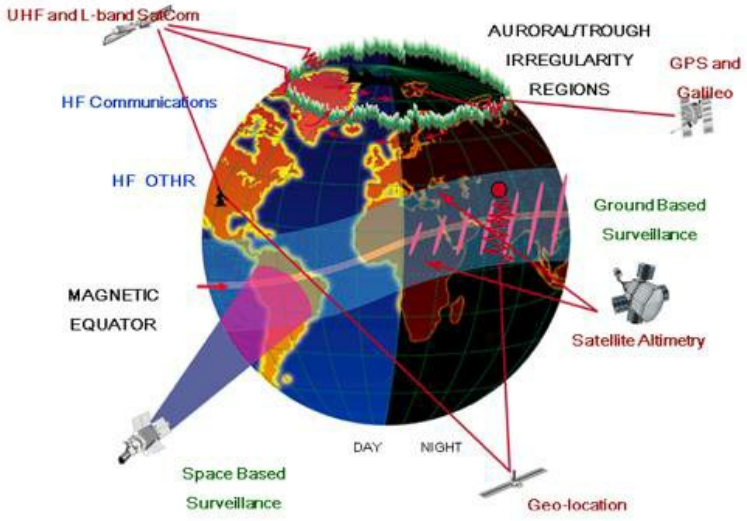
PoyntingSpace

PoyntingSpace undertakes fundamental and bridging research in the field of Space Weather and Space Sensors. Our expertise includes mitigating the effects of the ionosphere on various radio systems which involve signal propagation through or via the ionosphere.



Projects

Analytic Descriptions of the Ionospheric Impact on Space-Based Synthetic Aperture Radar, Funded by EPSRC, starting March 2011.

The ionosphere is the dominant degrading factor in terrestrial, low-frequency (UHF) space-based synthetic aperture radar (SAR). The ionosphere controls the orbit choice, the selection of the transmitted waveforms and integration times together with signal and image post-processing. We are quantifying the effects of the ionosphere (total electron content and irregularities) on SAR to offer mitigation strategies.

The ionospheric effects considered are those that affect SAR (i) resolution, (ii) interferometry, (iii) polarimetry, (iv) radiometric calibration and (v) image quality and focus.

1. We are developing analytical (as opposed to numerical) techniques to quantify the various ionospheric impacts on SAR images. Using these analytic expressions, the dependency of the SAR performance on the ionosphere will be established. This will enable the SAR design space to be searched, the performance optimized for a given task, and mitigation strategies developed.

2. We are validating these analytic expressions against numerical simulation AND against experimental L-band PALSAR imaging of calibrated targets located in the equatorial region, At the same time we will measure the background quiescent and disturbed ionosphere using leading edge equipment.

3. Using our new analytic theory we will determine the accuracy with which biomass is estimated using a low frequency SAR under various ionospheric conditions. This will enable the uncertainties in the calculation of carbon stocks, an important parameter in predicting global warming, to be quantified. Impact will be enhanced by developing strategies and mitigation techniques for minimizing this error.

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