

RBSP-SuperDARN coordination working Group report from May 2011 SWG/June 2011 SuperDARN workshop

The RBSPSD session consisted of the following presentations and resulting discussions:

- Global electric fields (John Wygant)
- SuperDARN/StormDARN (Jo Baker)
- SuperDARN/RBSP coordination (Tim Yeoman for Jim Wild)
- SuperDARN ULF wave measurements with RBSP (Tim Yeoman)
- EMIC waves and RBSP (Tim Yeoman/Sasha Ukhorskiy for Jonny Rae)

The current progress, thoughts and actions resulting from this and the SuperDARN workshop are listed below.

Priority Science Topics

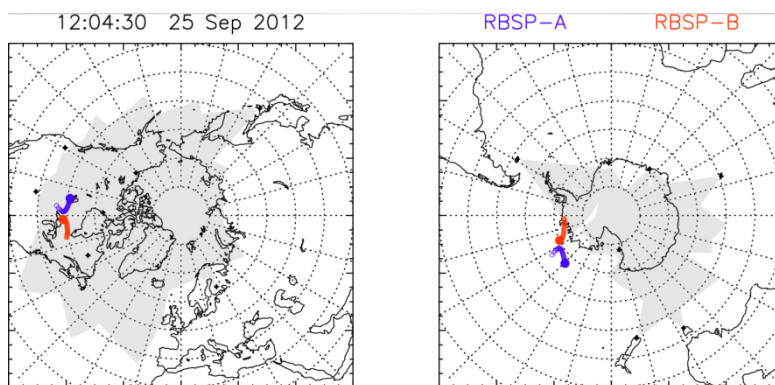
Global Electrodynamics

Potential electric fields in the ionosphere vs. in situ electric fields: investigation of inductive fields and field-aligned potential drops

Global convection response to storms and substorms, mesoscale convection near RBSP footprints vs. in situ electric fields and particles.

Direct comparison of magnetosphere pressure gradients (RBSP) and field aligned and ionospheric currents (SuperDARN)

Likely to focus on radars at apogee footprints, plus global potential solution



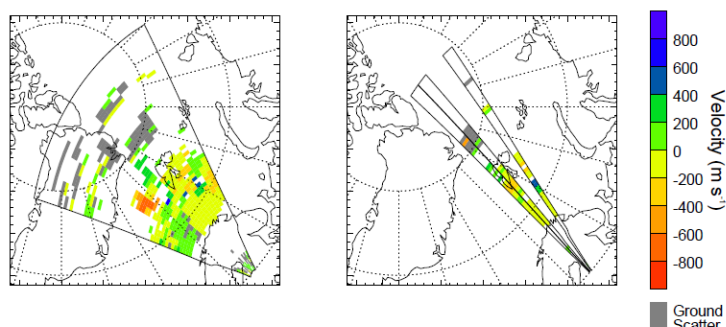
Typical RBSP apogee footprints

Storm effects in the ionosphere (including HF absorption) vs in situ measurements and precipitating particles (BARREL).

ULF Waves

SuperDARN can measure ULF wave frequency, ionospheric electric field, azimuthal structure locally and globally. m up to ~ 100 , (attenuation factor of ~ 50 in ground magnetometer data) whilst RBSP measures energetic particles and chorus waves. Could provide a global measurement or latitude/MLT distribution. Azimuthal structure can be retained with higher time resolution given a THEMIS-

plus type mode. This would reduce the spatial and/or temporal resolution of the global convection field.



Candidate THEMIS-plus radar mode

Pc3-5 band (1000 - 10s): Direct measurement on a global scale from all radars. Ionospheric and ground scatter can provide information (direct measurement of electric field and Doppler shifts due to wave modulation of the reflection height). Covered by existing THEMIS mode or similar.

Could design software to generate an integrated wave power in defined frequency bands, or combined data products with ground magnetometer measurements.

EMIC Waves

ULF EMIC 10 - 0.2 s: Direct measurements possible from SuperDARN at the lower end of the frequency scale (all radars), Raw IQ sample data analysis in the middle (partial array coverage), spectral width broadening as a diagnostic at the upper end of frequency scale (all radars).

Radar Operations

At the SuperDARN workshop, the radar PIs were enthusiastic about providing network-wide support for the RBSP mission.

Responsive scheduling. It was agreed that the radars could change mode in response to storm alerts. This can be achieved through a web-based storm alert flag. Jeff Spaleta (UAF) has already given the implementation of this flag into the current radar scheduling software some thought.

It is likely that this would trigger the full array into an RBSP mode. In addition radars at the apogee footprints of RBSP would be scheduled into an RBSP mode routinely, as is currently done for e.g. THEMIS. It is likely this would be a different mode than the global mode, and would not be over-ridden by the storm alert flag.

Actions

- Implement and test responsive scheduling alert flag
- Poll radar PIs to establish individual radar capabilities for responsive scheduling and raw IQ operations.
- Test raw IQ sampling modes for EMIC waves in conjunction with search coil magnetometer data (StormDARN radars and Churchill line?).

- Run test SuperDARN-ionospheric heater experiments to test raw IQ sampling in narrow spectral width scatter for EMIC wave detection (EISCAT/Hankasalmi and or HAARP/Kodiak).
- Agree a network wide (mode 1) and apogee footprint mode (mode 2). Test the agreed modes. Should the network run a THEMIS-plus mode for ULF wave azimuthal structure at optimum time resolution as mode 1, or should we aim for 1 min scans over the network for mode 1? Do we want a THEMIS-plus mode at the apogee footprints (mode 2)? Should raw IQ be run wherever possible, or only in conjunction with mode 2?

Tim Yeoman/Sasha Ukhorskiy 17/06/2011