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Energy input in the dayside polar cap during IMF By dominated conditions: Summer vs. Winter

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Space Hurricane: When IMF By and dipole tilt have same polarity

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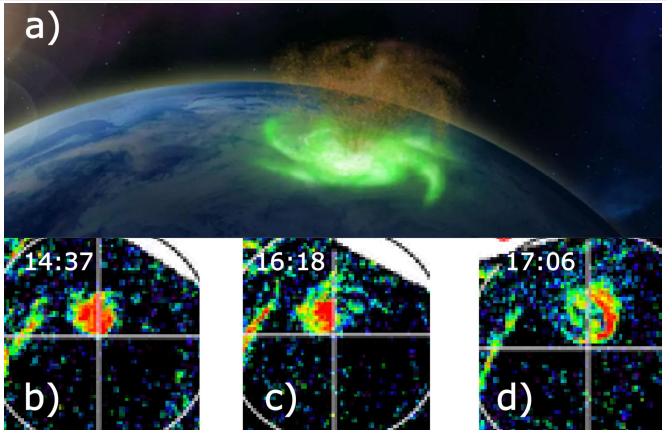
For only one polarity of IMF By, energetic electron precipitation is seen in the summer hemisphere dayside polar cap, known as High Latitude Dayside Aurora (HiLDA) (Frey et al 2004).

This phenomenon have structured precipitation features (sometimes seen as “spiral arms”), and coincide with strong vortical convection and upward Birkeland currents, related to **lobe reconnection**

- Zhang et al. (2021) coined the term “Space Hurricane”



Zhang et al. (2021)
Dayside polar cap
Northern summer, +By

The Space Hurricane feature (including the HiLDA precipitation) is expected to be present only in one hemisphere:

- **Significant hemispheric differences in polar latitude energy input**
- **Such events are considered “quiet” at auroral and mid latitudes (small AL/AU/SYM-H)**

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LOcal Mapping of Polar ionospheric Electrodynamics: Lompe

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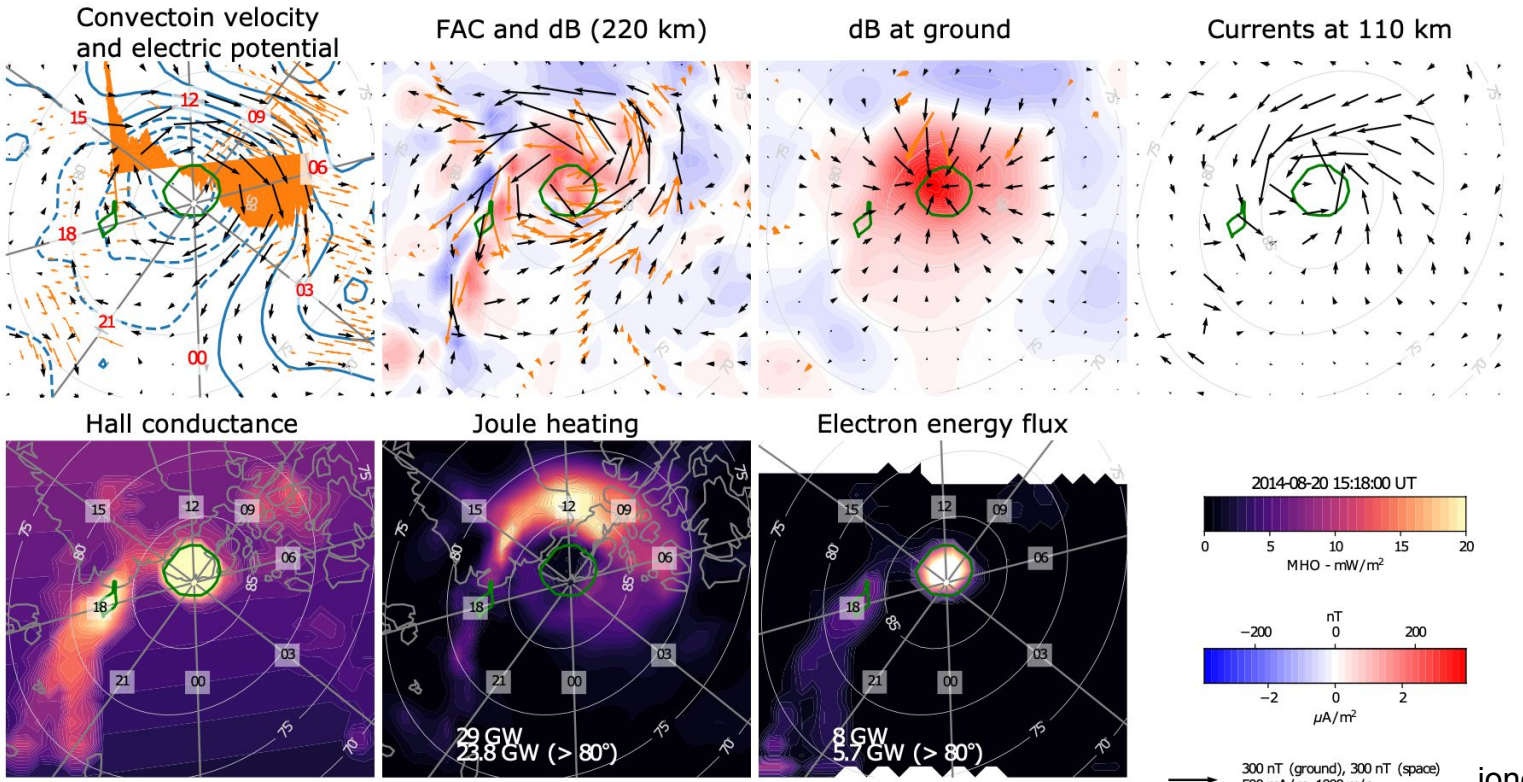
Lompe data assimilation technique, Laundal et al. (2022): **Relate observations of electrodynamic quantities by ionospheric Ohms law, solve for continuous regional description.**



Lompe input:
SuperDARN, AMPERE, SuperMAG, DMSP SSIES (orange arrows)

5 min data window centered at 15:18 UT during the “Space Hurricane event” (Zhang et al. 2021)

Conductance: EUV + precipitation (SSUSI)

Lompe output:
Black arrows, electric potential and joule heating maps

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Space Hurricane event: Lompe results from Southern hemisphere

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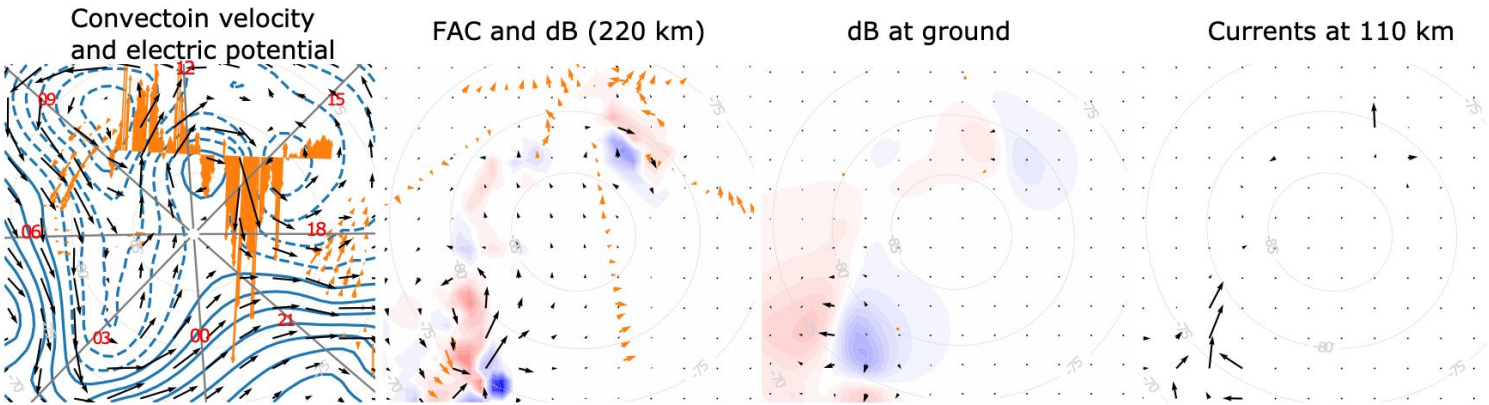
Lompe data assimilation technique, Laundal et al. (2022): **Relate observations of electrodynamic quantities by ionospheric Ohms law, solve for continuous regional description.**



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IMF By and dipole tilt is the common situation

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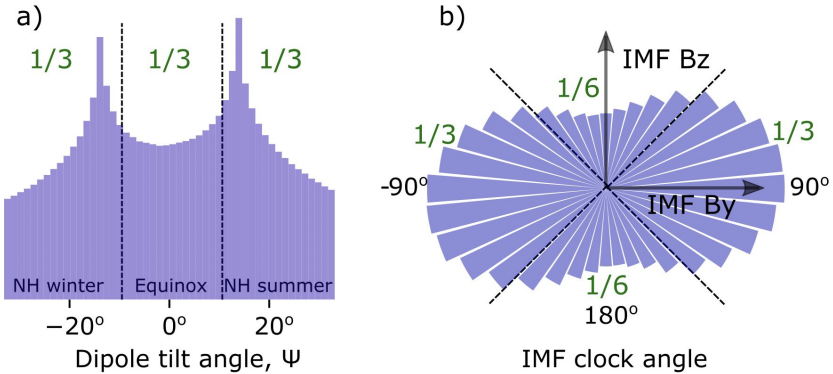
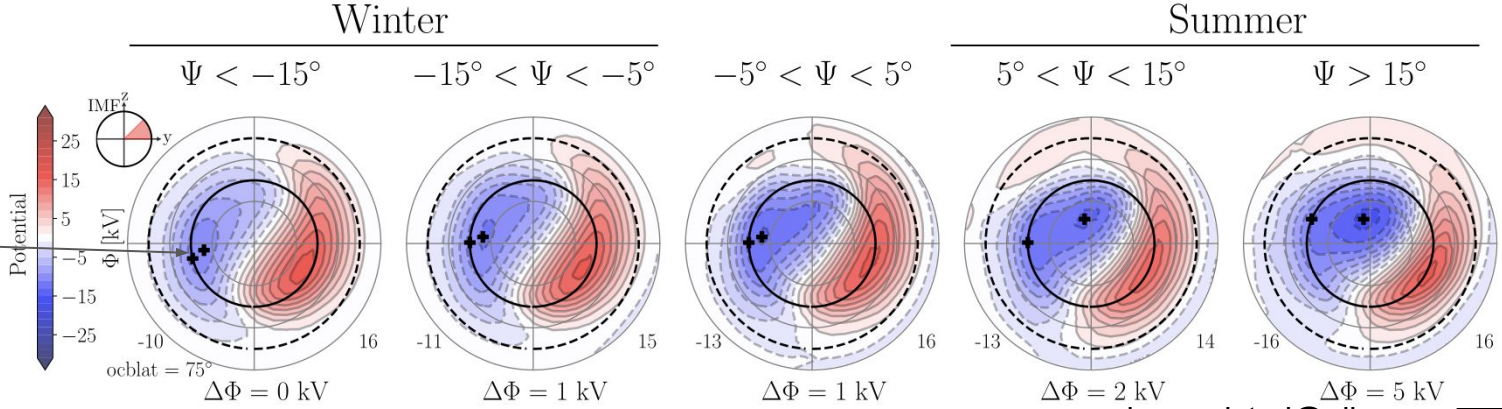
Occurrence probability



Why important:

- **Energy deposition at polar latitudes are typically different between hemispheres during "quiet" periods**
- **Polar energy deposition during "quiet" times can influence thermosphere composition (O/N_2 ratio) at auroral and mid latitudes through transport (neutral winds)**

SuperDARN, convection relative to open/closed boundary



Reistad et al. (2021)

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