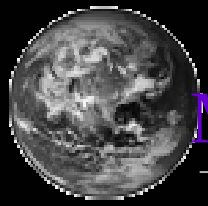


Meridian Scanning Photometers

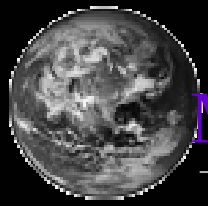
Overview

NORSTAR (NORthern Solar Terrestrial Array) is one of the 7 program elements of Canadian GeoSpace Monitoring. The NORSTAR mission is to specify quantify the spatio-temporal distribution of auroral precipitation across North-Western Canada. The NORSTAR FOVs overlap and complement those of the other CGSM instruments, which include the CARISMA and CANMOS magnetometers, the SuperDARN and PolarDARN HF radars, and the CADI digital ionosonde array. NORSTAR data is increasingly available via the CSSDP, NORSTAR-Web, GAIA, and GLORIA. We have plans to provide a subset of our data to the CDAWeb and SPIDR data distribution systems. We are an active participant in the GAIA Virtual Observatory, and through that, the eGY, IPY, and LWS Data Environment programs.

Our science objectives are those of CGSM, and are summarized best by the five CGSM “grand challenge” themes which are

(1) Driving and control of magnetospheric convection.
(2) Triggering and development of magnetotail instabilities and flows.
(3) Generation, modulation, and multi-scale structure of auroral processes.
(4) Acceleration, transport and loss of energetic particles in the magnetosphere.
(5) Cold plasma injection, transport, and loss in the global magnetosphere.

NORSTAR



Meridian Scanning Photometers

Overview

NORSTAR is comprised of the former CANOPUS MSP and riometer arrays, coupled with a new array of multispectral and full-color ASIs. We are in the process of a three year upgrade to the NORSTAR system, during which we are developing a new data distribution system, new connectivity to instruments in the field, and installing the new ASIs.

The appropriate contacts for the NORSTAR/CANOPUS MSP team are as follows:

Eric Donovan (NORSTAR PI)	eric@phys.ucalgary.ca
Fokke Creutzberg (CANOPUS MPA PI)	fcreutzb@NRCan.gc.ca
Brian Jackel (MSP Specialist)	bjackel@phys.ucalgary.ca
Trond Trondsen (MSP Re-Design Lead)	trondsen@phys.ucalgary.ca
Greg Baker (MSP Technical Lead)	baker@phys.ucalgary.ca
Emma Spanswick (MSP Web Page)	emma@phys.ucalgary.ca

There is also a developing NORSTAR MSP science team which includes the above and

Igor Voronkov	igor@phys.ucalgary.ca
Jonny Rae	jrae@space.ualberta.ca
Thayyil Jayachandran	jaya@unb.ca

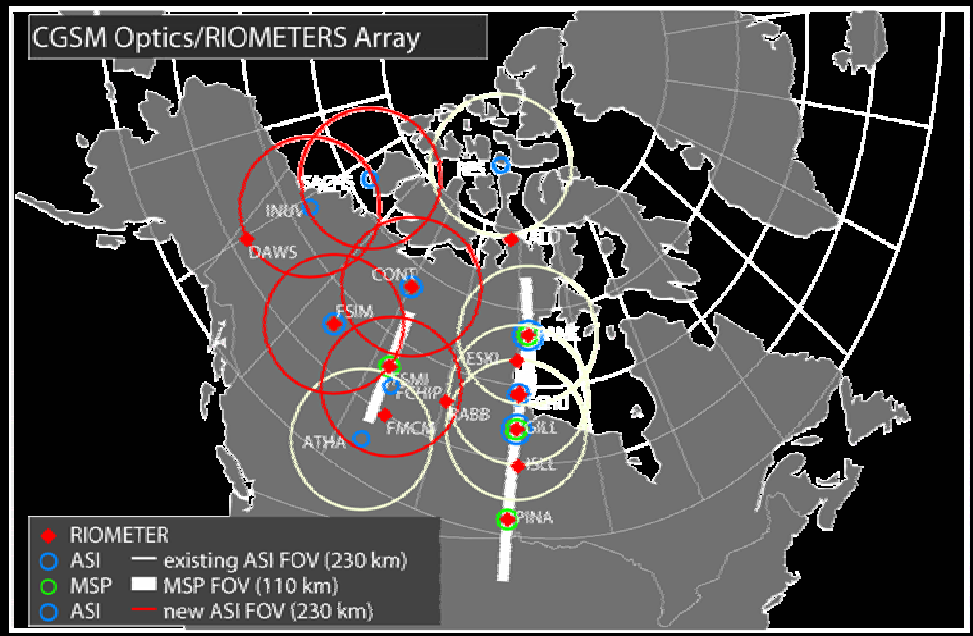
Meridian Scanning Photometers

Context

NORSTAR

4 MSPs†
5(10) ASIs
13 Riometers†

† - Formerly operated by CANOPUS



NORSTAR

Meridian Scanning Photometers

Quantitative Observations

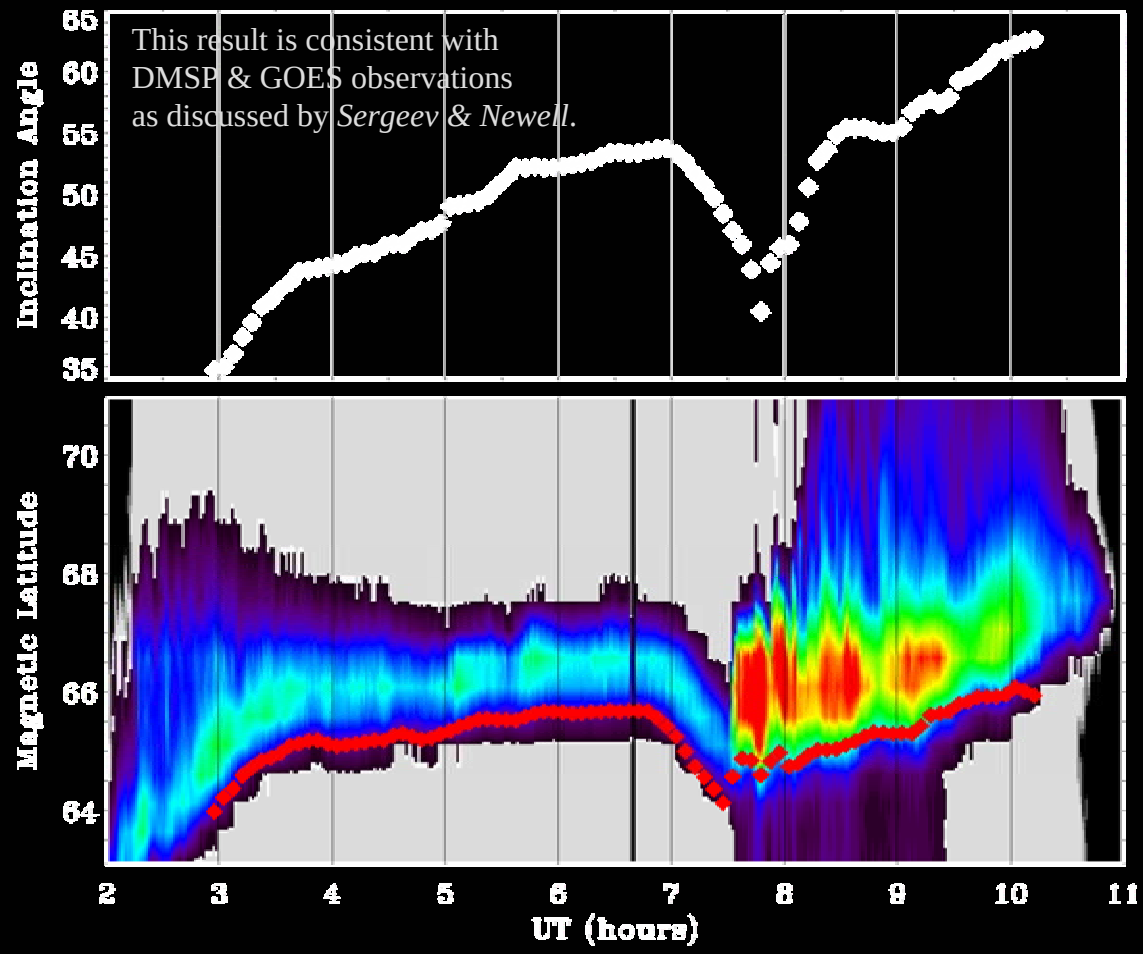
Four Wavelengths

The aurora provides the only means of following the spatio-temporal evolution of (in this case) the ionospheric projection of the Earthward limit of strong pitch angle scattering in the CPS.

This provides a powerful complement to MHD simulations and empirical models [eg., *Wanliss et al*, 2000].

Other important boundaries :

- *poleward borders of the (bright) proton aurora*
- *630 nm polar cap shelf*
- *equatorward boundary of the 630 nm brightness*



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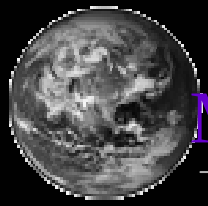


Meridian Scanning Photometers

MSP Daily Save File

File Name is yymmdd_new_mpa.sav

File contains structure mpa_data

Structure is mpa_data.station(17,6,1440)

Station can be rankin, gillam, pinawa, or fsmith.

The array indices are latitude bin (17 with 0 being northernmost), channel (6 with channels 1, 3, 4, and 5 indicating 630, 486 “H-beta”, 471, and 558 nm, respectively), and time (1440, where I indicates ith minute of day starting from midnight UT).

Numbers are in Rayleighs. Estimated geomagnetic and geodetic latitudes and longitudes corresponding to bins are stored in mpa_bin_locations.sav. In that file the key arrays will be

lat_geodetic_110 (and corresponding lon and corresponding _230 for both), where 110 indicates assumed height in km.

inlat_pace_110 (and corresponding _230 version).

For those arrays, there are 4X17 elements, where the 4 is for station number with 0-1-2-3 being rankin-gillam-pinawa-fort smith, respectively.

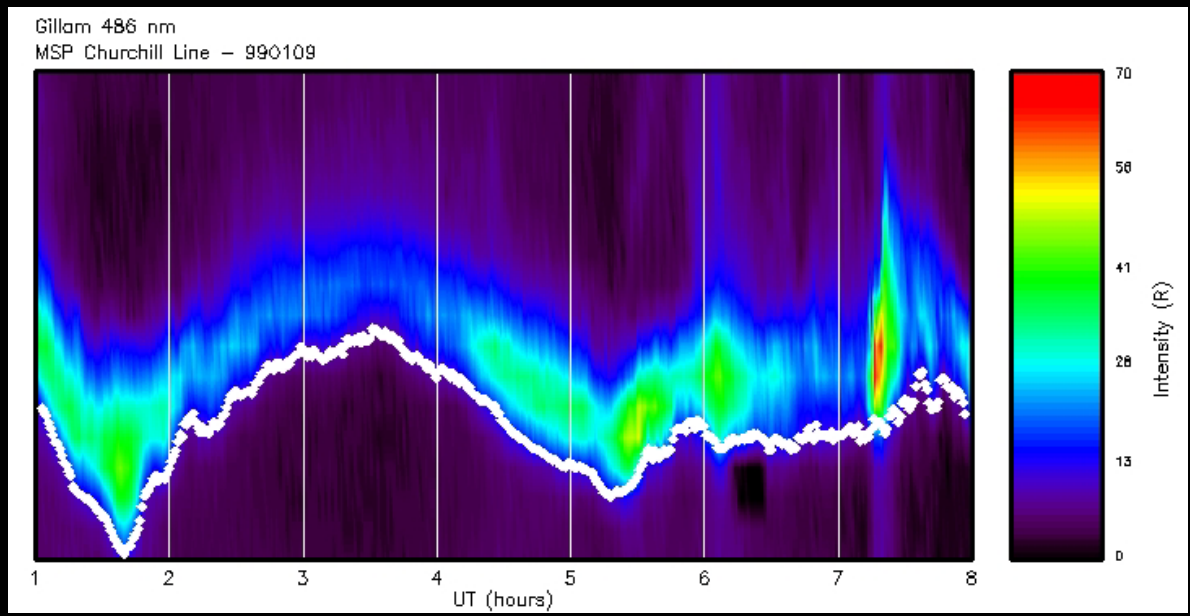
NORSTAR

Meridian Scanning Photometers

MSP Daily Save File

Example – 990109 – h-beta data (Channel 3)

Boundary is “optical b2i” as determined by algorithm of *Donovan et al*. [JGR, 2003]



NORSTAR