Automatic Whistler Detector and Analyzer Network (AWDANet):

Real-time monitoring of plasmaspheric electron densities

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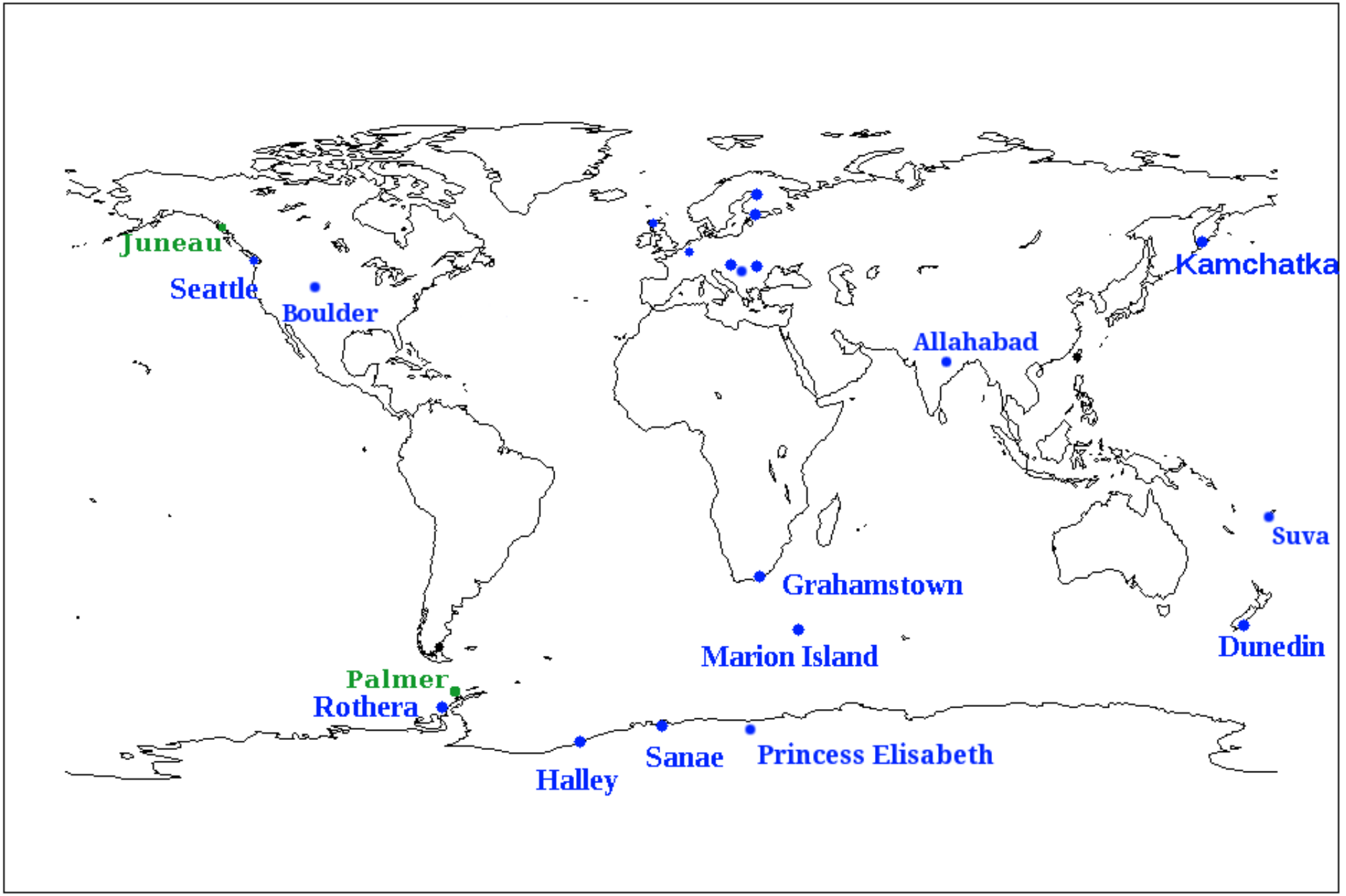
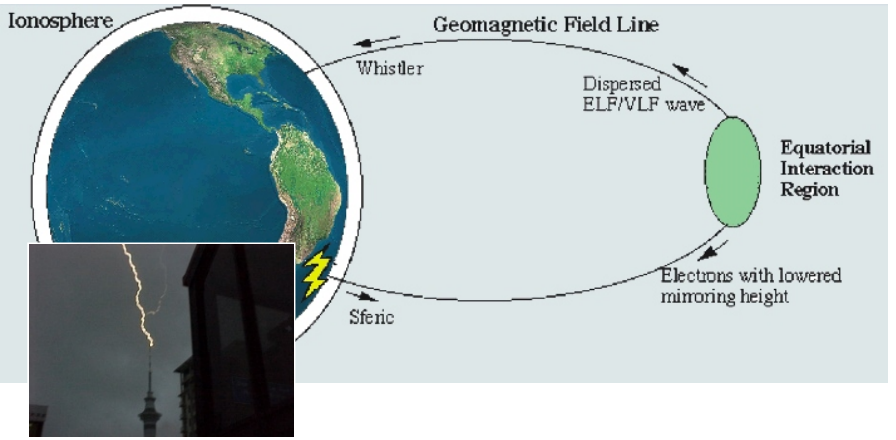
AWDANet (PLASMON) stations around the world

as of June 2016



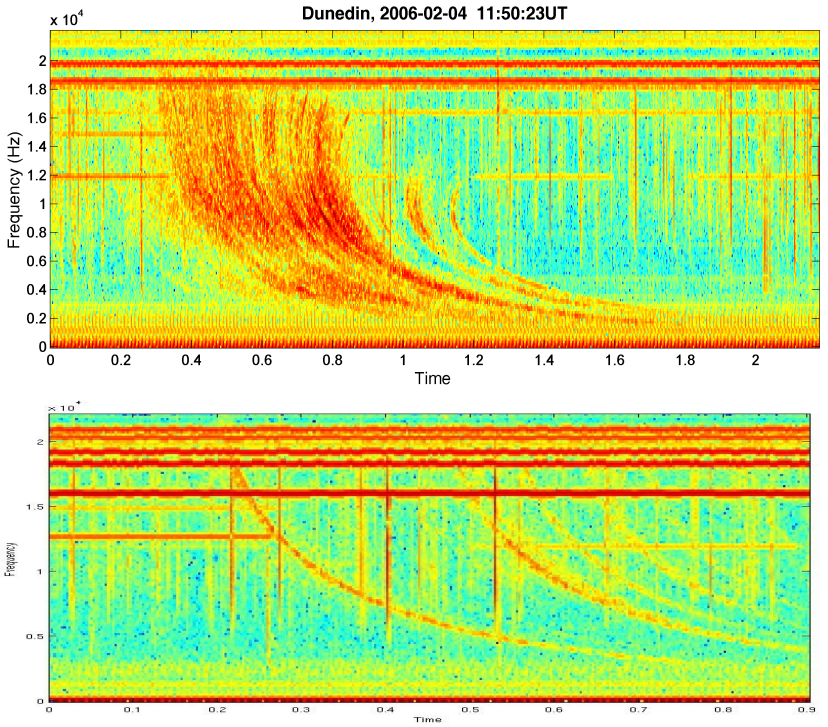
Whistlers

- Whistlers are VLF (3-30 kHz) impulses generated by lightning, traveling along magnetic field lines, observable on the ground and/or in space



- Through propagation in the plasma content of the magnetosphere, they acquire a **frequency-time signal with a characteristic shape**

- The time delay depends on the plasma density along the propagation path
- ⇒ Whistler measurements tell us about the **plasma density** in the plasmasphere



Automatic Whistler Analysis*

- Benefits:
  1. **fully automated** (unlike previous inversion algorithms)
  2. also handles **whistler groups** (multiple propagation path whistler traces) consistently

* Lichtenberger, J. (2009), A new whistler inversion method, J. Geophys. Res., 114, A07222.

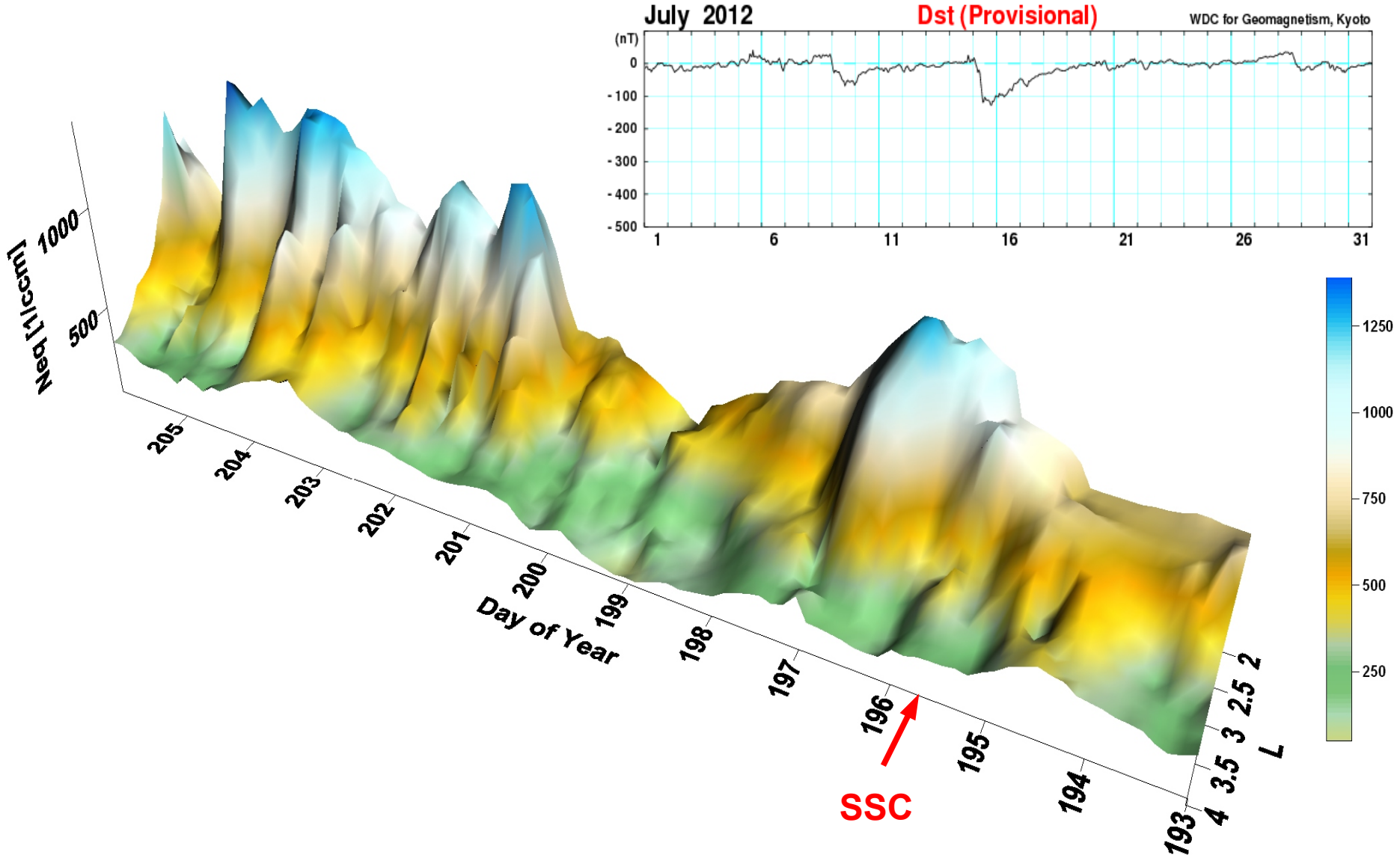
Implementation on GPU's

- Speed critical (+parallel) parts in **C/CUDA**
- 2 GeForce GTX 590 cards = 4 GPU cores per host
- one such host can process a MP whistler group in **~ 60 seconds**
  → real time processing is achieved!

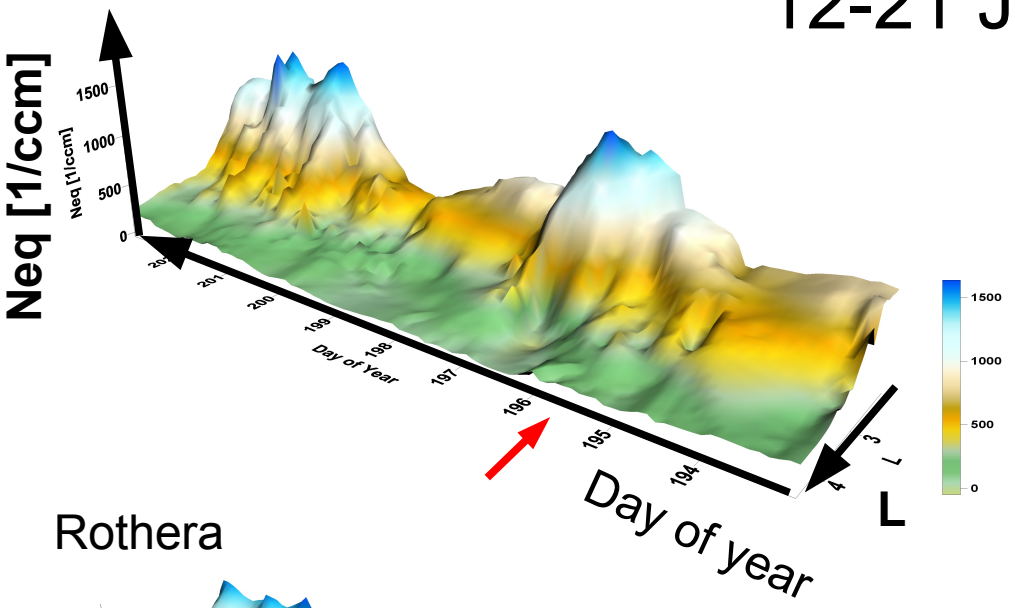
Disturbed period I.

Magnetic Storm on 15 July 2012 (DOY=196)

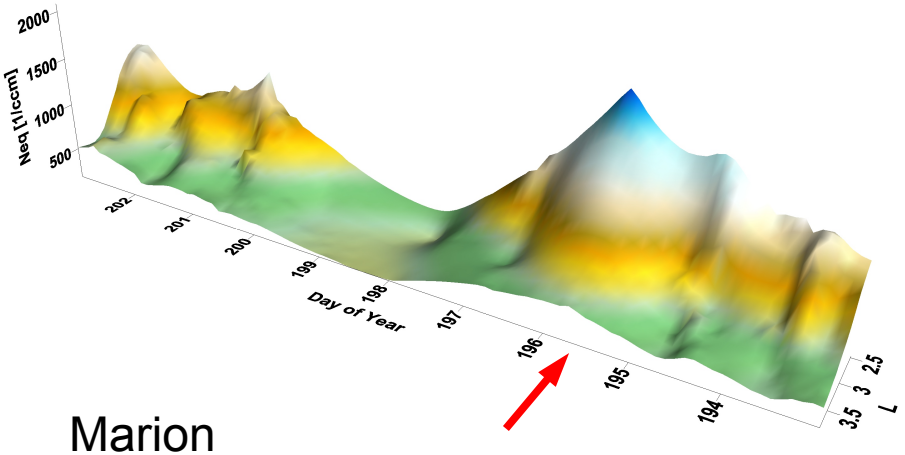
10535 whistler events recorded at Rothera (Antarctica)



12-21 July 2012

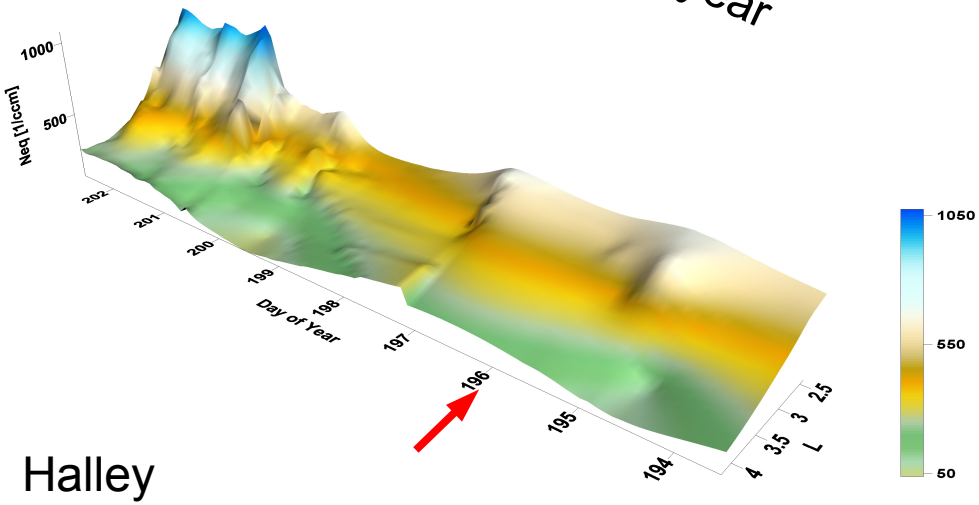


Rothera

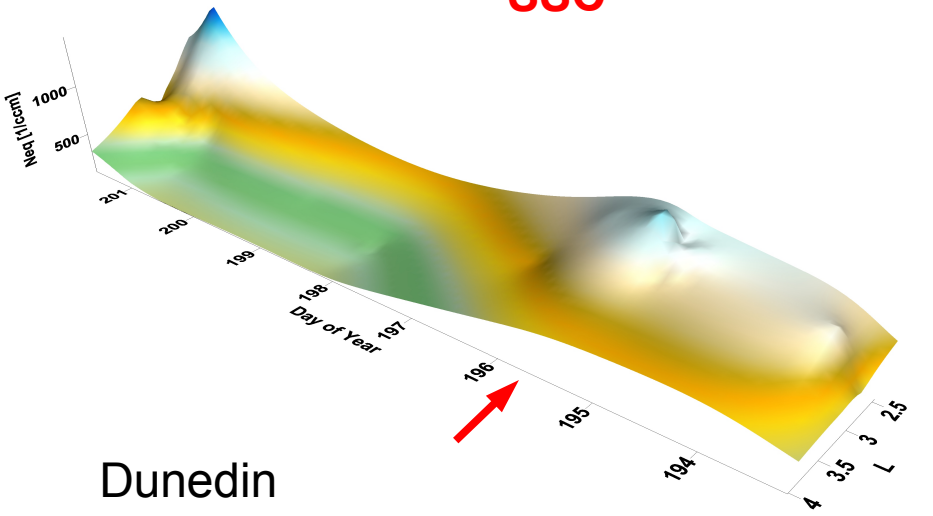


Marion

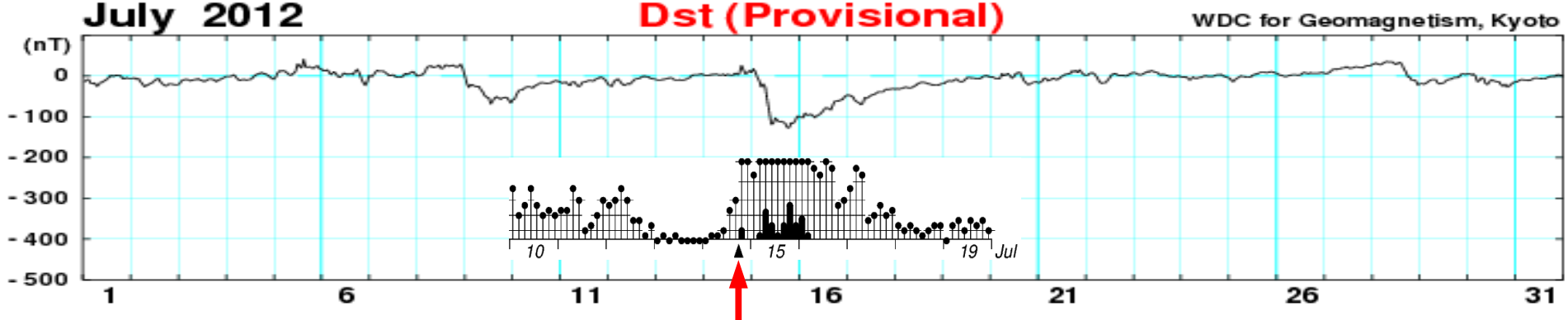
SSC



Halley

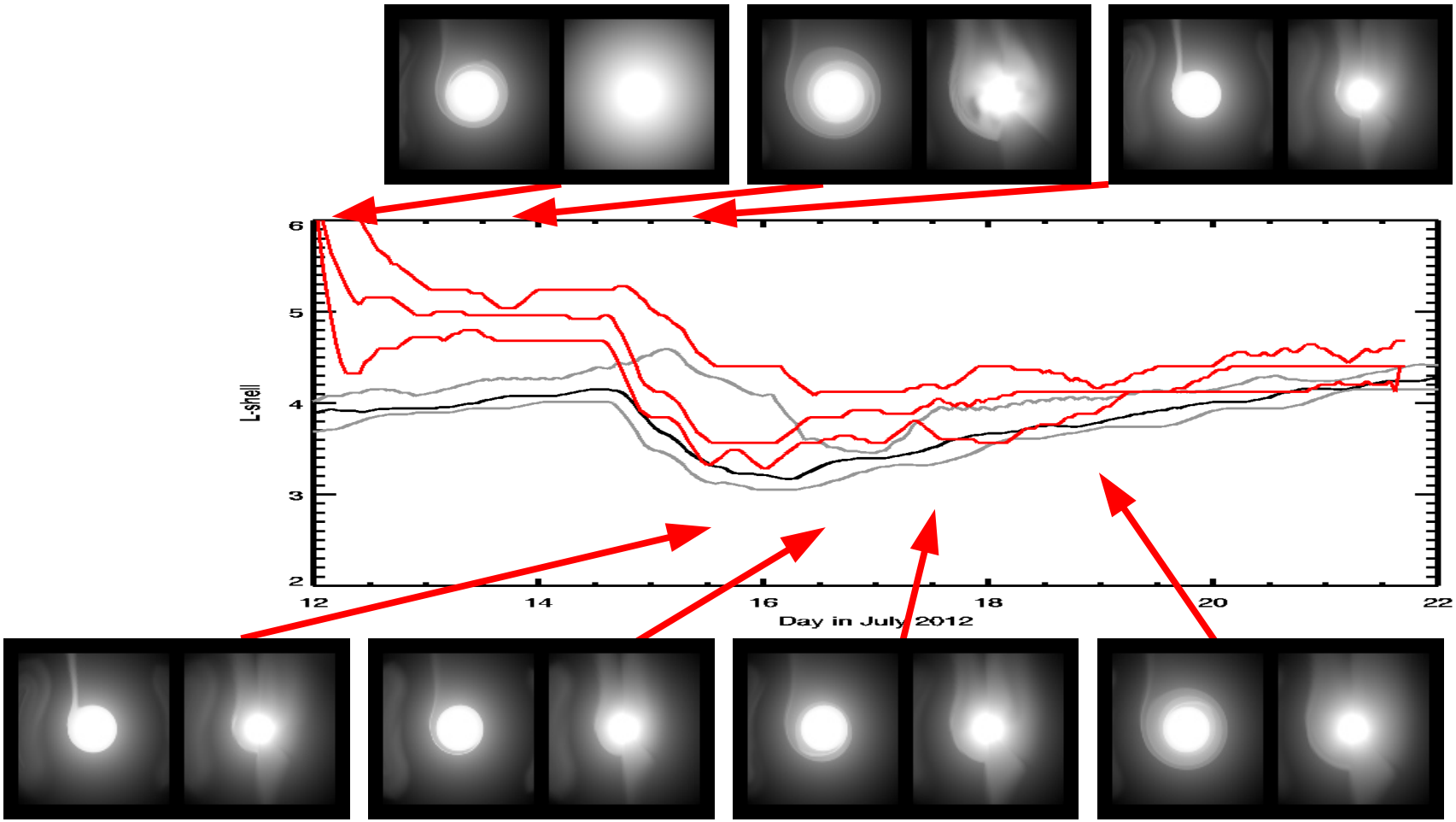


Dunedin



Assimilative Run for 2012 July Event

1. Initial model conditioning, then storm onset and shrinking plasmasphere



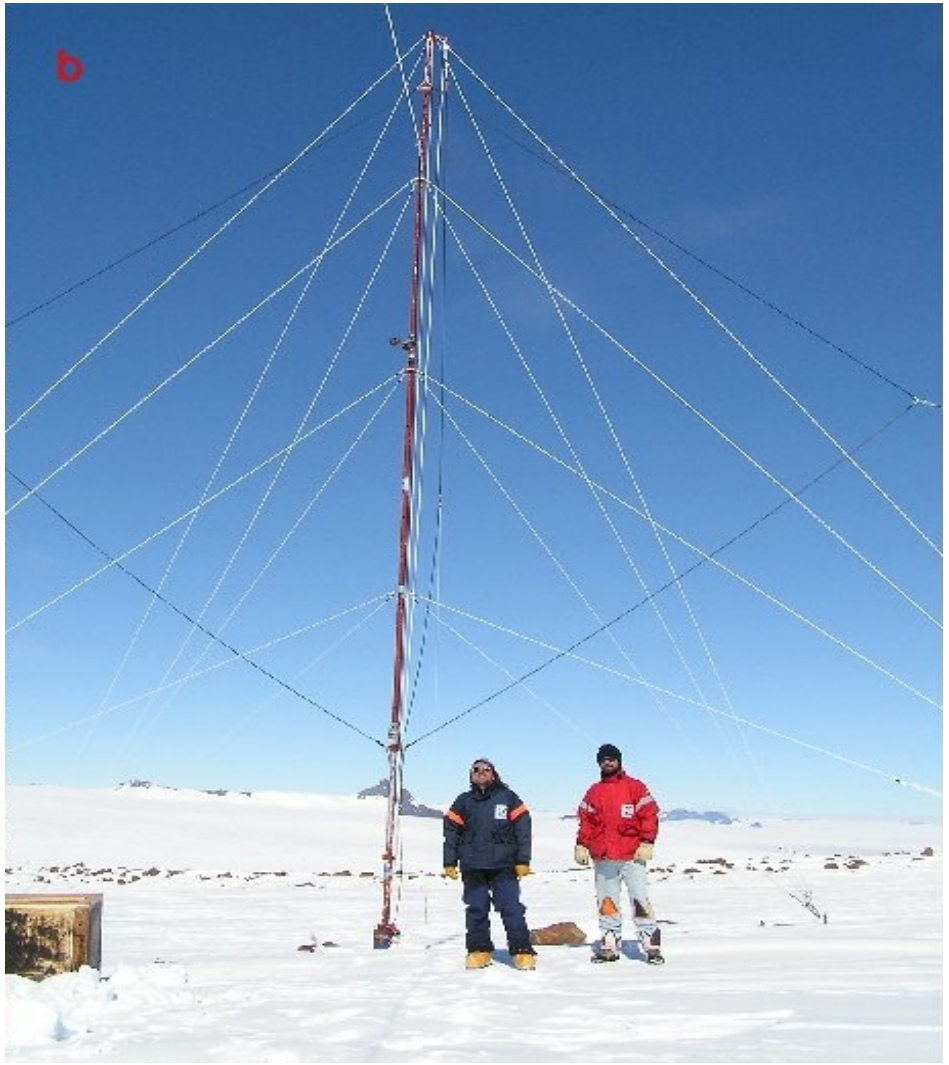
2. Recovery phase, plasmasphere refilling

no assimilation

assimilation

Plasma density maps. (DGCPM model. Data assimilation inputs from AWDANet and EMMA/McMAC)

AWDANet - Conclusion



- Automatic Whistler Detector and Analyzer Network
- Covering low, medium and high magnetic latitudes (40º-60º) (+ sometimes conjugates)
- Completion with **15 stations** @ middle of **2014**, in **real-time** operation since
- Archive data since **2002** (currently being processed)

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