

# FIRST RESULTS FROM A NETWORK OF GPS SCINTILLATION RECEIVERS IN THE ANTARCTIC

JOE KINRADE

GWSWF MODENA MEETING 11-12 APRIL 2011



**British  
Antarctic Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

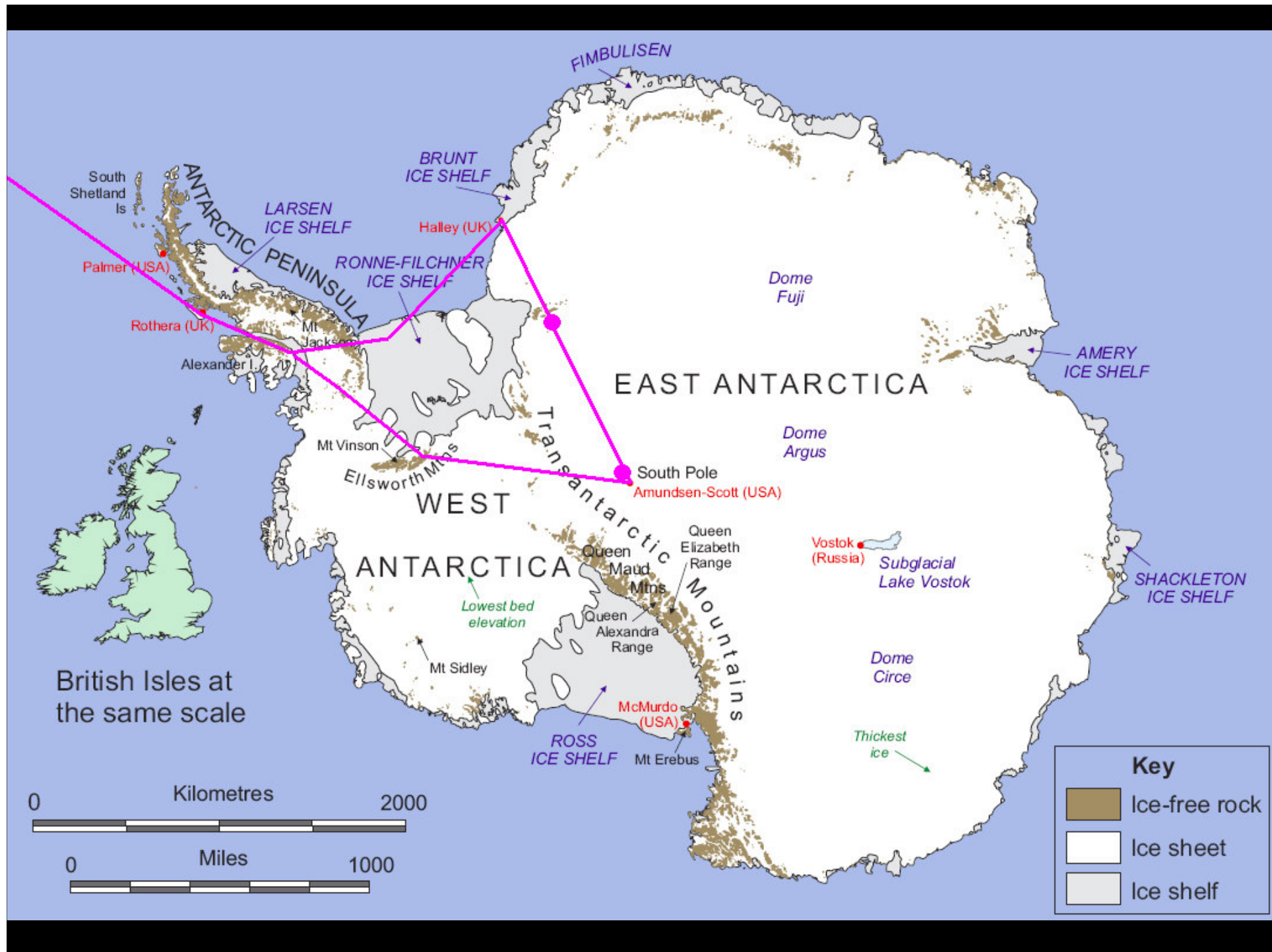


**NATURAL  
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RESEARCH COUNCIL**



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ANTARCTIC PENINSULA

South Shetland Is

Palmer (USA)

Rothera (UK)

Alexander I.

Mt Jack

BRUNT ICE SHELF

LARSEN ICE SHELF

RONNE-FILCHNER ICE SHELF

FIMBULISEN

Dome Fuji

EAST ANTARCTICA

AMERY ICE SHELF

Dome Argus

South Pole  
Amundsen-Scott (USA)

WEST ANTARCTICA

Ellsworth Mtns

Transantarctic Mountains

Queen Elizabeth Range

Queen Maud Mtns

Queen Alexandra Range

Vostok (Russia)

Subglacial Lake Vostok

SHACKLETON ICE SHELF

Dome Circe

Lowest bed elevation

Thickest ice

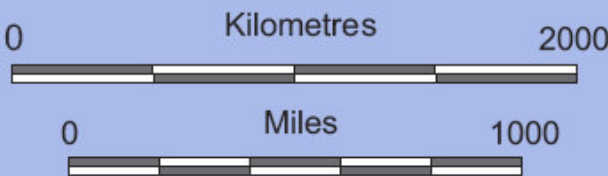
McMurdo (USA)

ROSS ICE SHELF

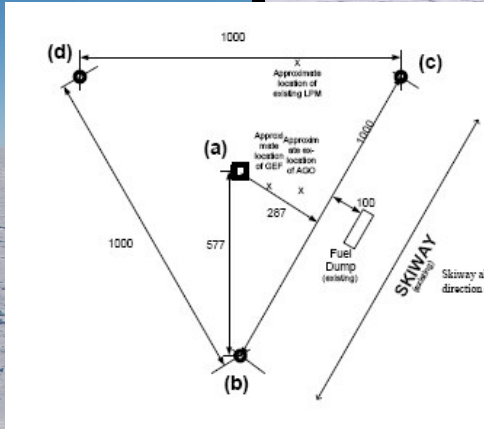
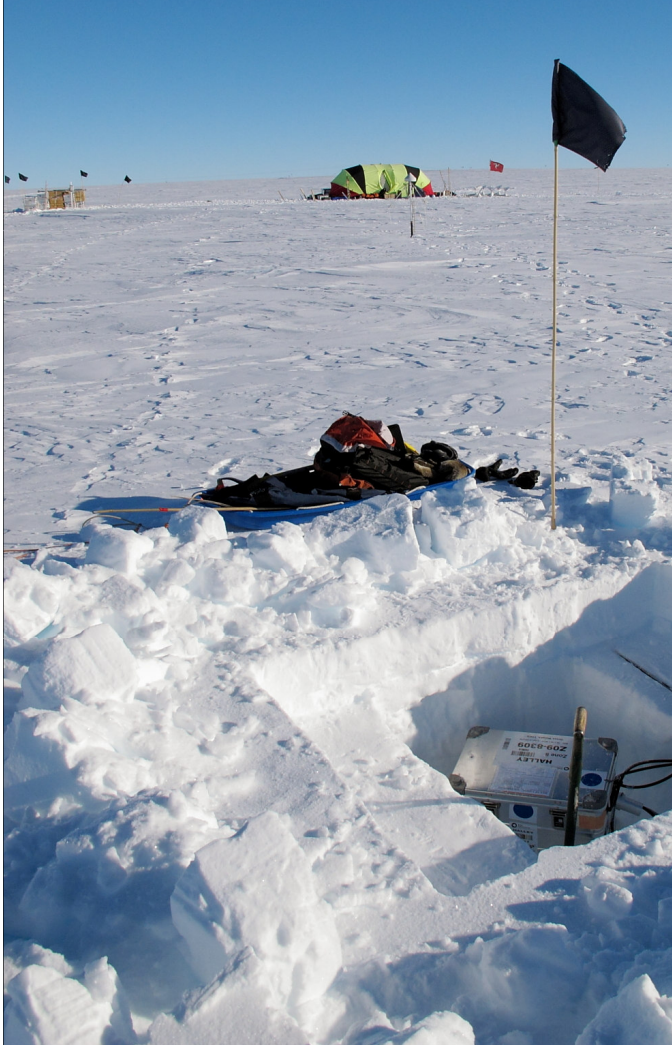
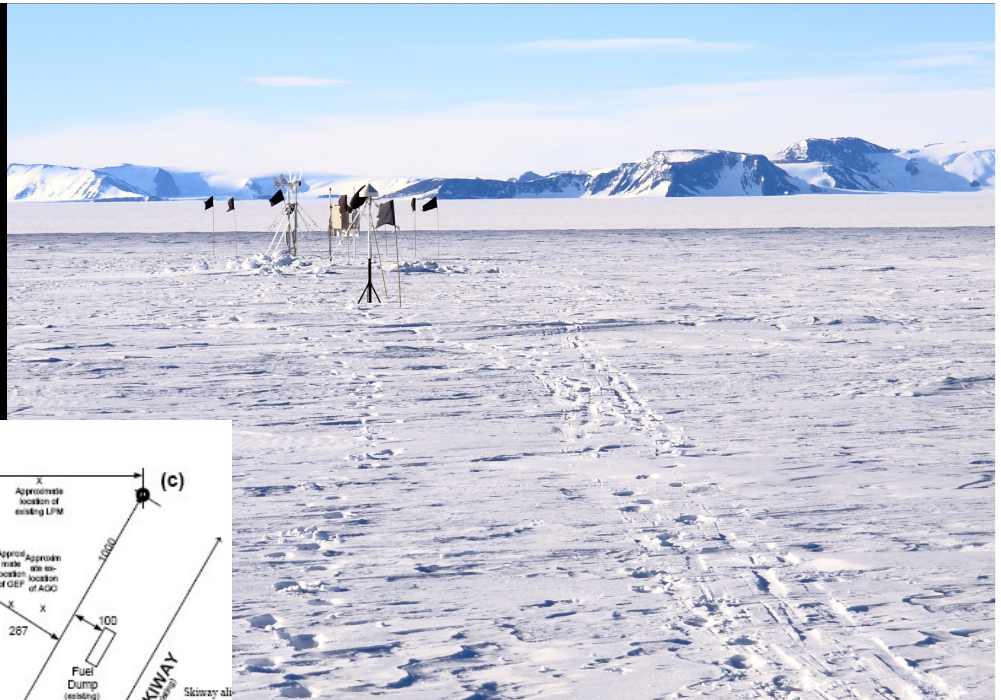
Mt Erebus

Mt Sidley

British Isles at the same scale



Key	
	Ice-free rock
	Ice sheet
	Ice shelf

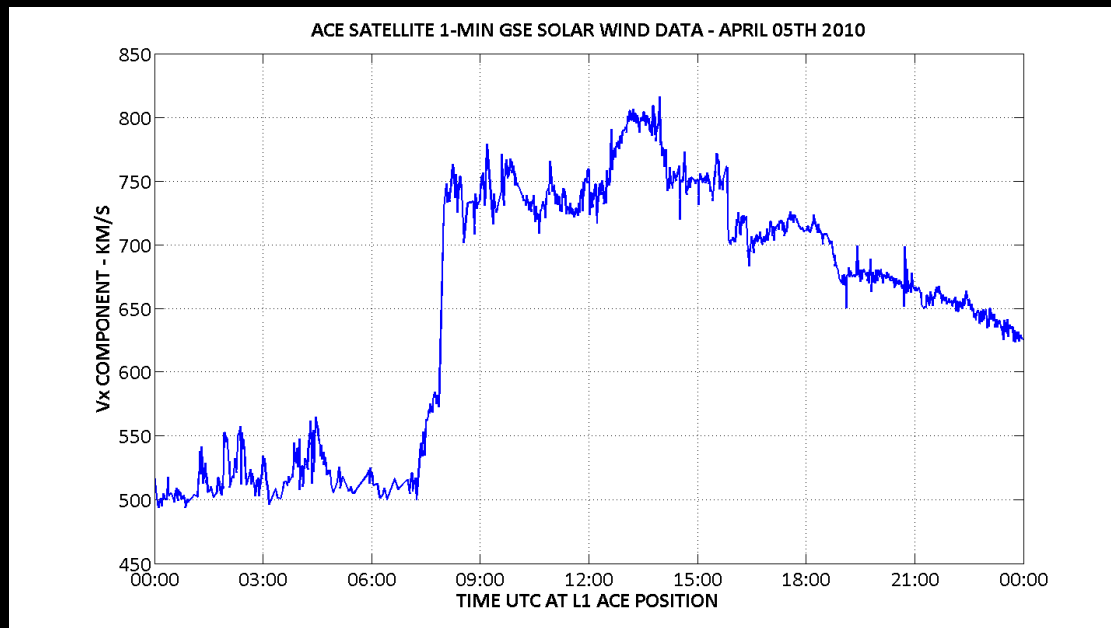
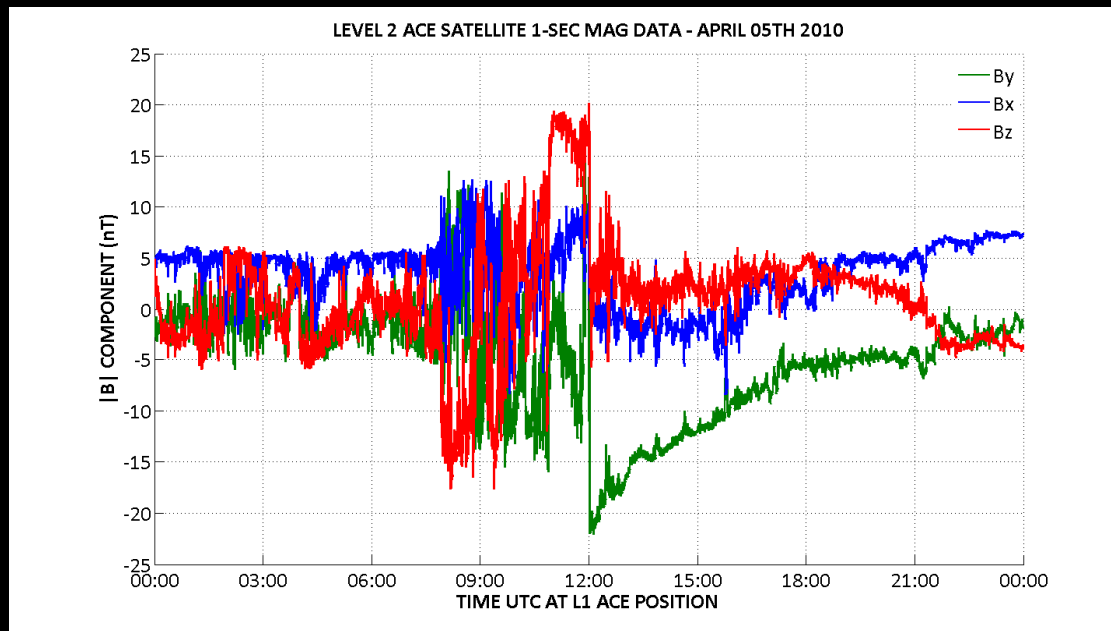




## Case Study – 05<sup>th</sup> and 06<sup>th</sup> April 2010

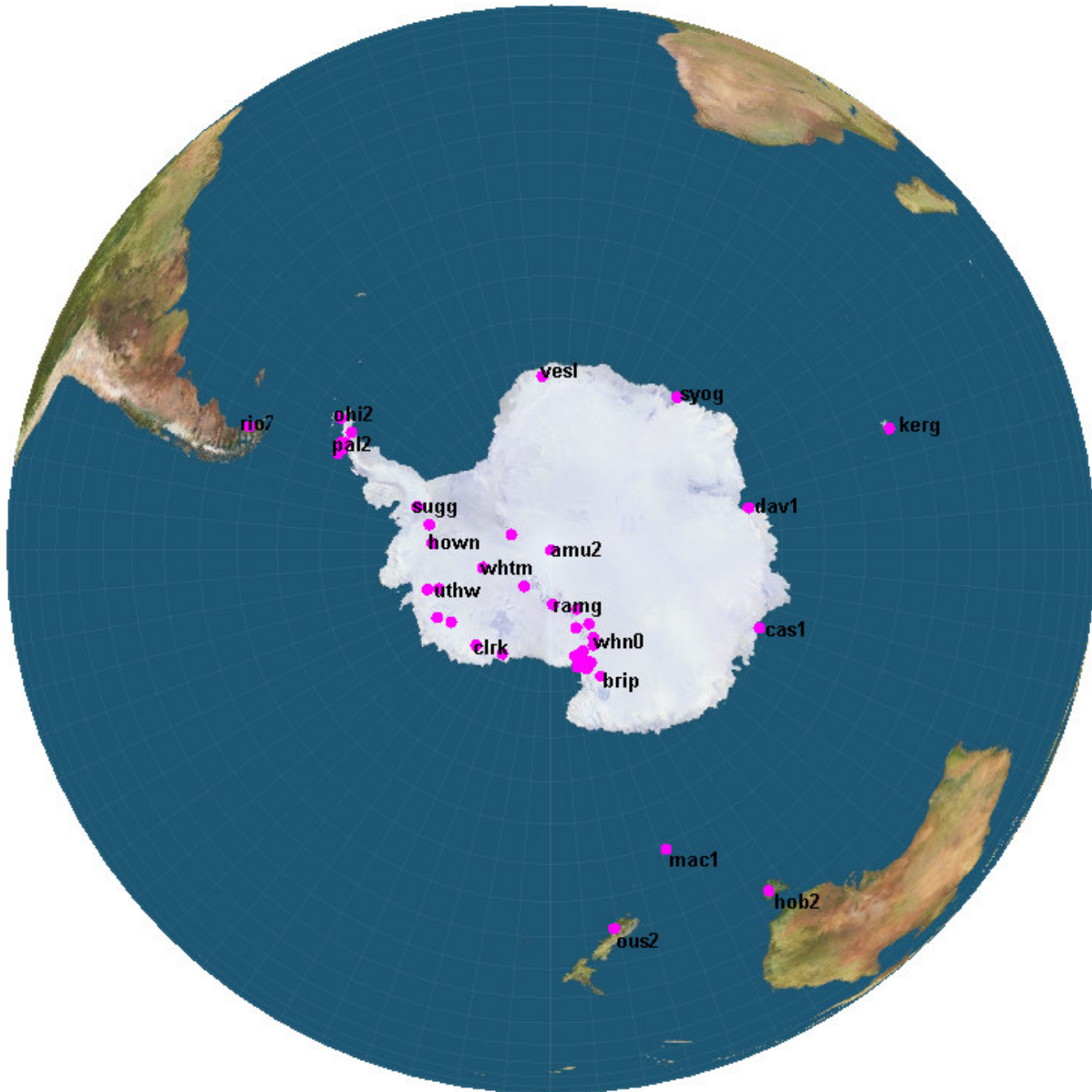
Three aspects:

- 1) Ionospheric TEC imaging by inversion tomography (MIDAS).
- 2) Superposition of scintillation indices in an effort to discover any temporal and spatial correlation with plasma structuring.
- 3) Ionospheric specification for satellite-based P-Band SAR applications.



ACE level 2 magnetometer data provided by the ACE SWEPAM instrument team and the ACE Science Centre. ACE solar wind velocity data obtained from the Space Physics Interactive Data Resource (SPIDR) of NOAA.

# Dual Frequency GPS Receiver Coverage – April 2010



POLENET

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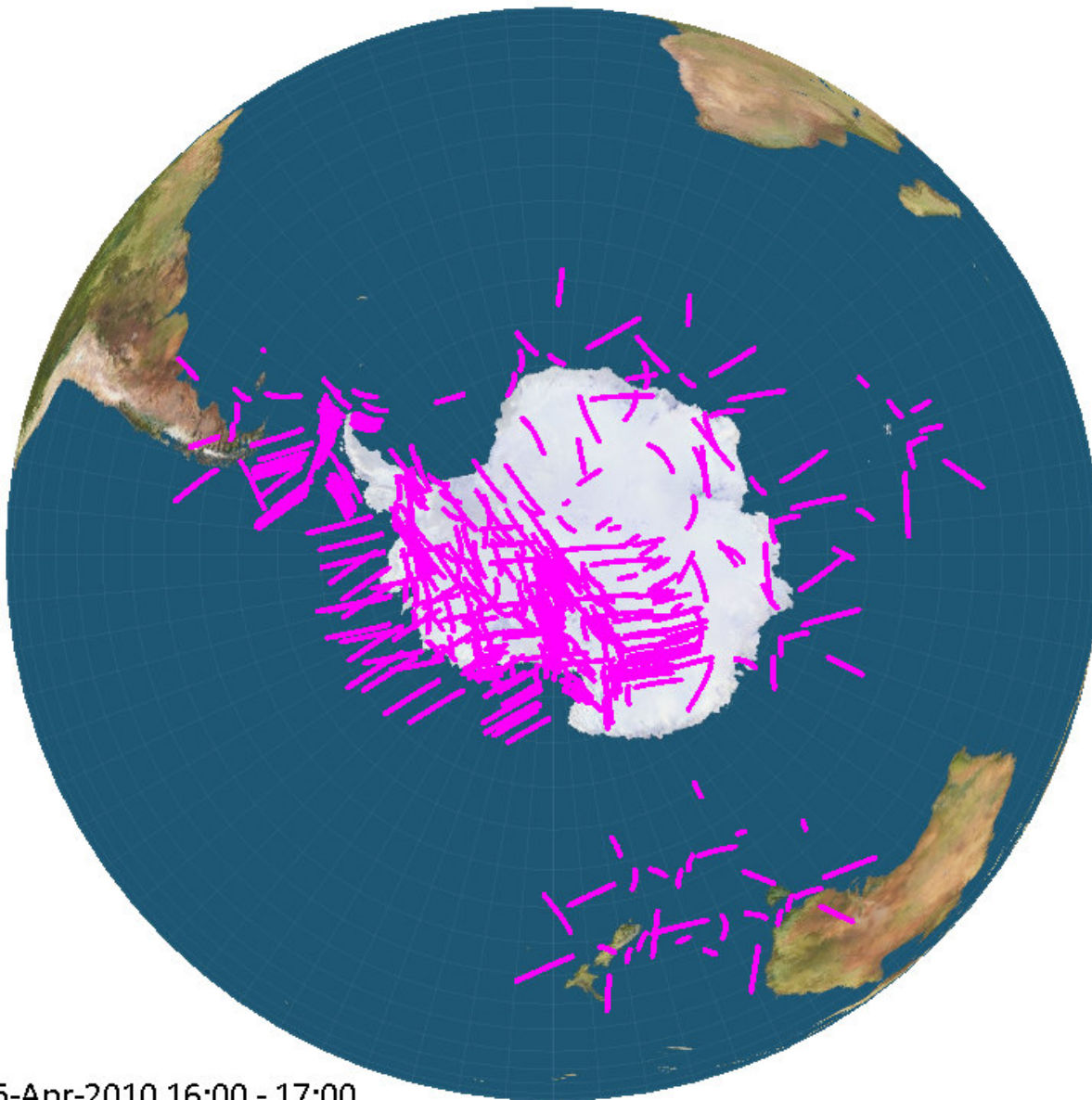
IGS

+

IPY

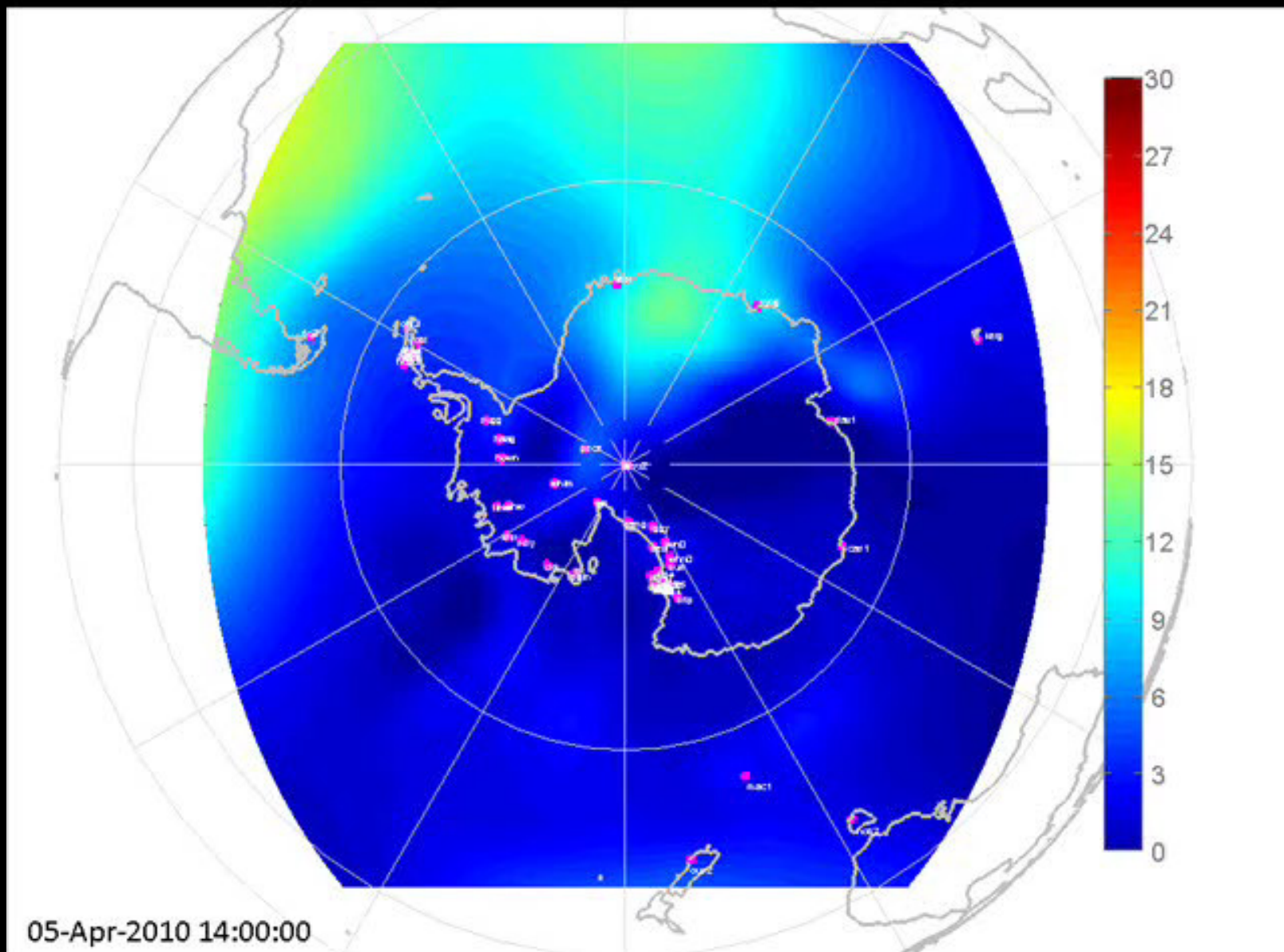
*This material is based on data services provided by the UNAVCO Facility with support from the National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA) under NSF Cooperative Agreement No. EAR-0735156.*

# Raypath Coverage for Inversion Imaging

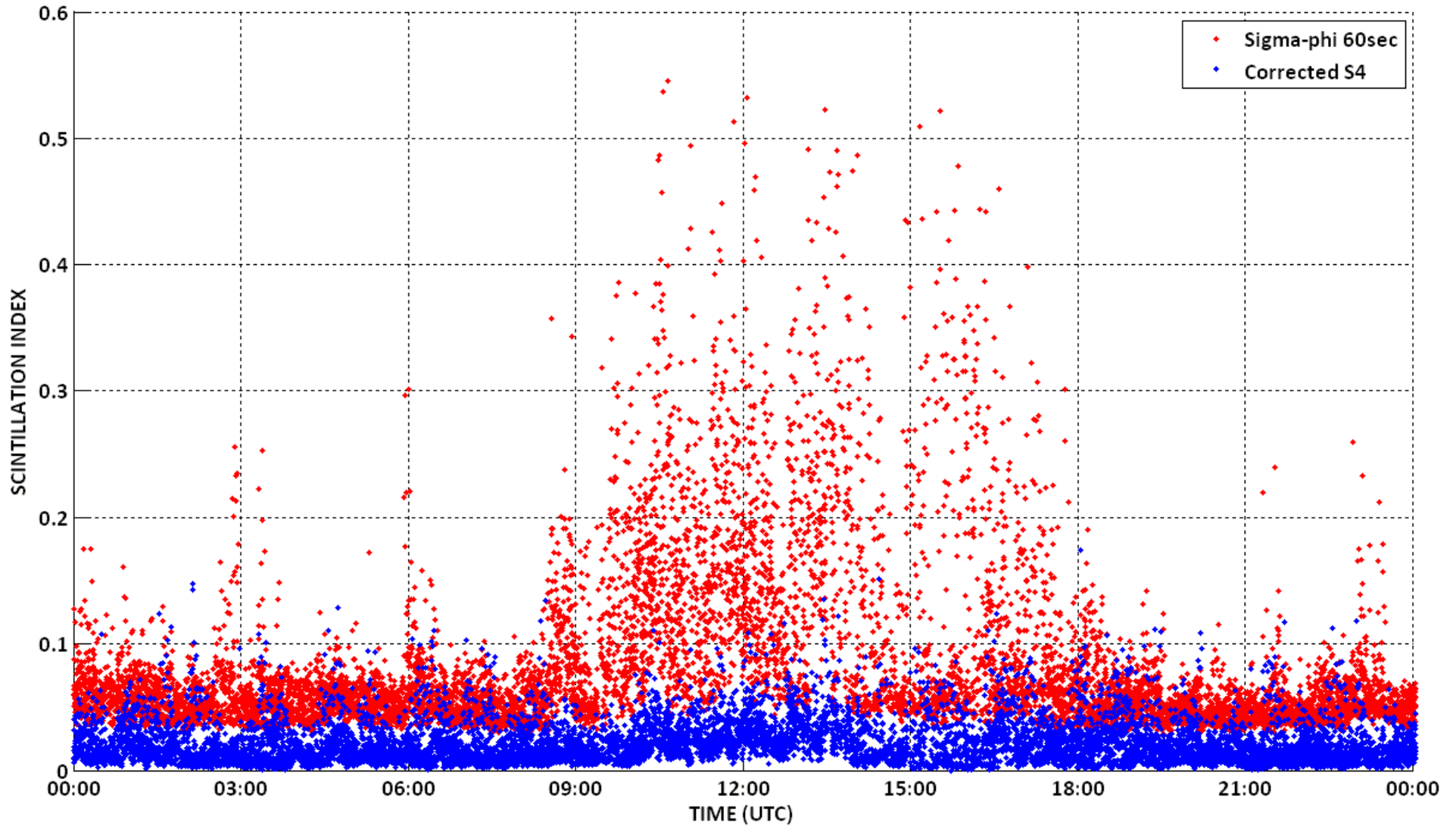


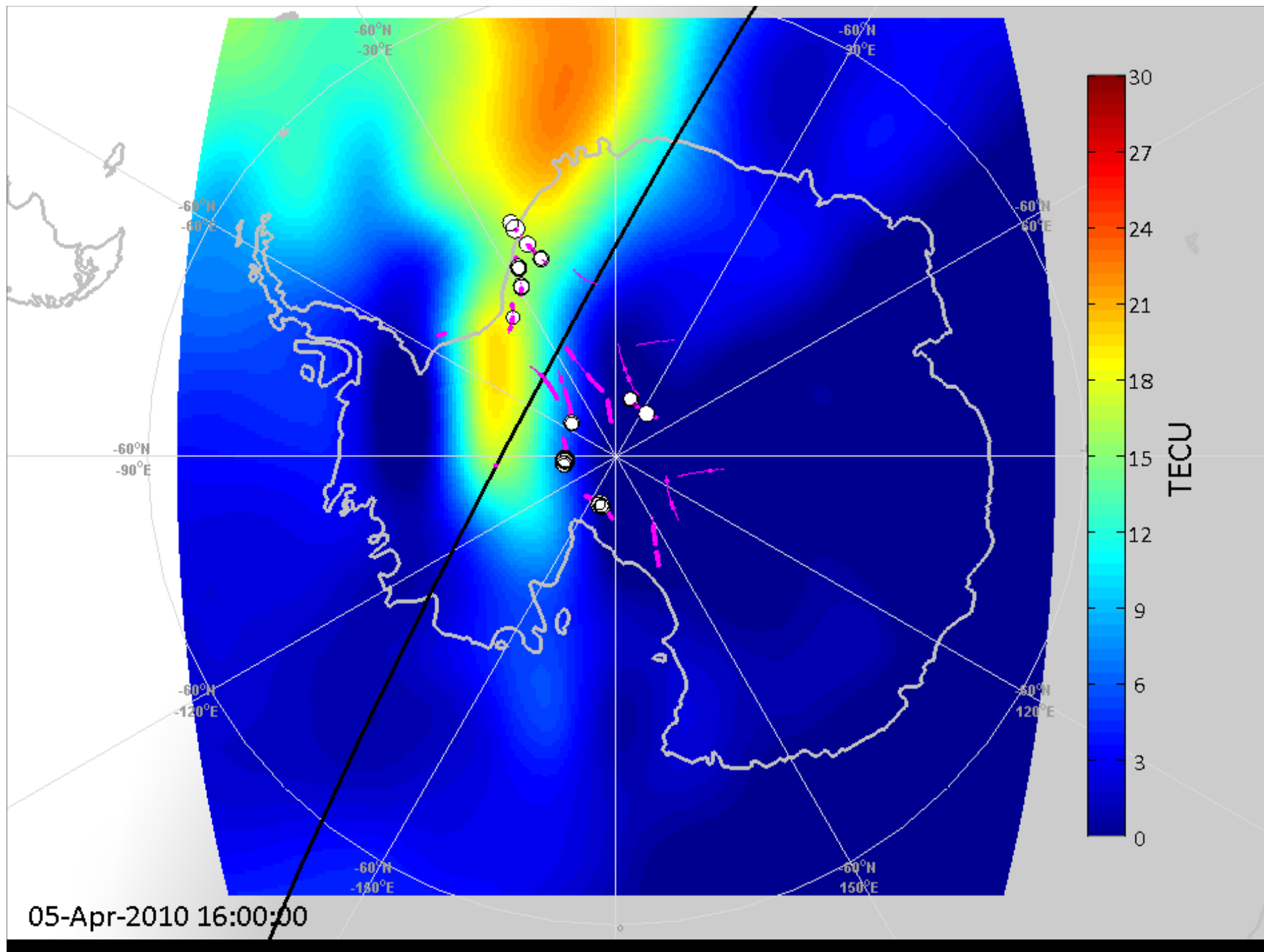
05-Apr-2010 16:00 - 17:00

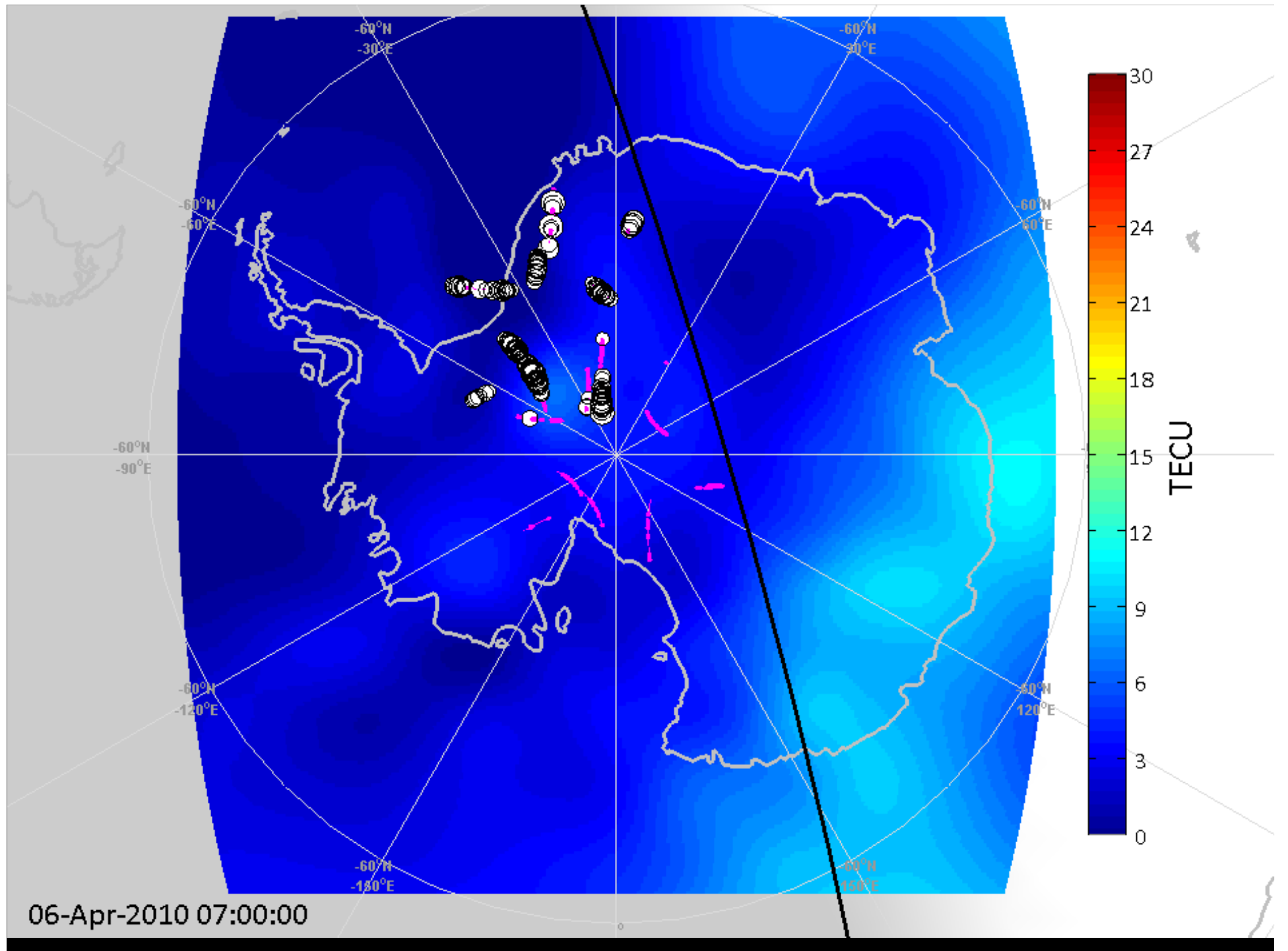




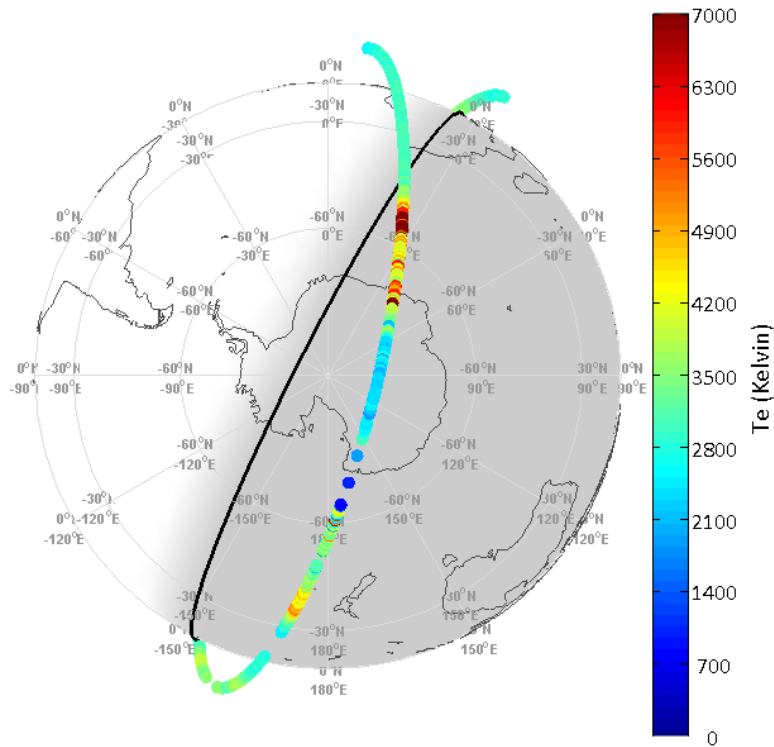
SOUTH POLE STATION - ALL OBSERVED GPS SATELLITE L1 SCINTILLATION INDICES DURING APRIL 05TH 2010



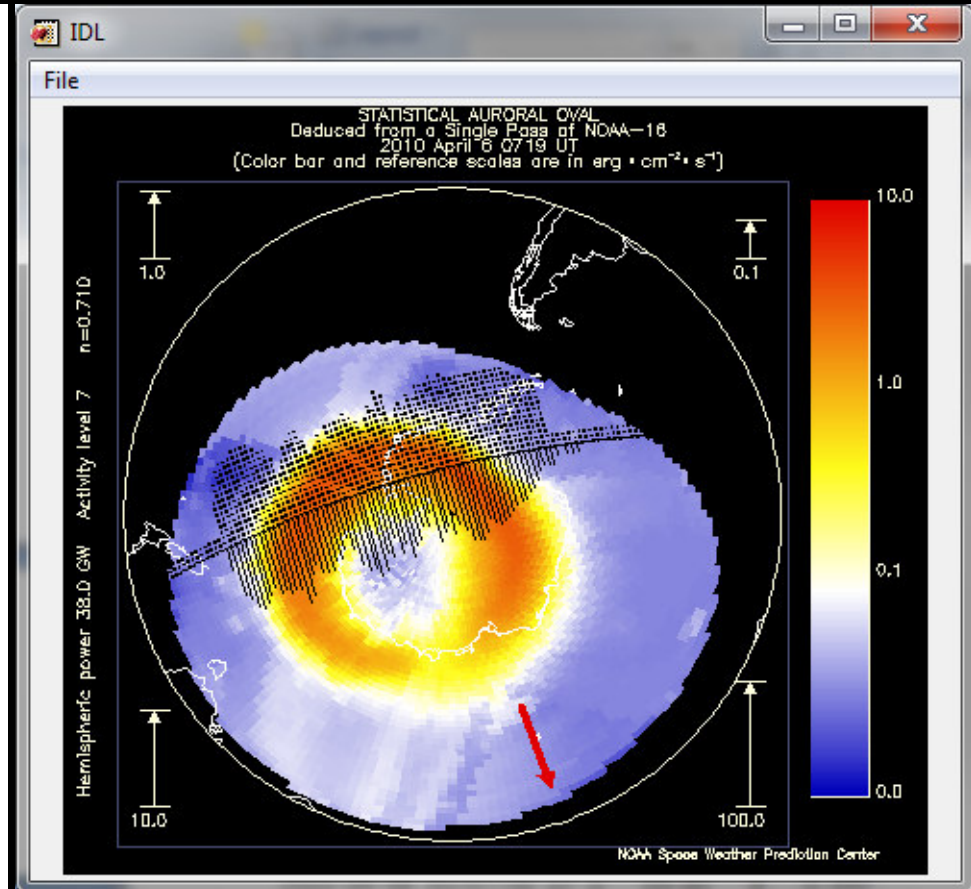




# Verifying Images – Multi-instrument Approach



DMSP F15 2010-04-05 15:18:14 - 2010-04-05 16:59:54



DMSP thermal plasma data provided by the Centre for Space Sciences at the University of Dallas at Texas and the US Air Force. POES statistical auroral images provided by the Space Weather prediction Centre (SWPC) of NOAA.

## Summary

- Network of remote GPS scintillation receivers now in second Antarctic season of operation.
- Obtaining data during the dark winter season is an engineering challenge.
- Plasma structure imaged during a geomagnetic disturbance during April 05<sup>th</sup> 2010.
- Phase scintillation observed over a two day period following the geomagnetic disturbance, possibly due to night-time return flow or auroral precipitation.



Questions?