

# U.S. POLENET – Status and Future GNSS – Overview and Status

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THE POLAR EARTH OBSERVING NETWORK

# Overview

- **GNSS Constellations**
  - GPS Status
- **Antarctic GNSS/GPS**
  - Polar Earth Observing Network (POLENET)
- **U.S. POLENET**
  - 2010-2011 Field Season
  - 2011-2012 Field Season
  - Future of the U.S. POLENET Program
    - Will most of the GNSS stations become a “permanent” network?



# GNSS – Today and Planned

- **Global Constellations**

- GPS (24+)
- GLONASS (30)
- Galileo (27+3)
- Compass (27+3 IGSO + 5 GEO)

- **Regional Constellations**

- QZSS (3)
- IRNSS (7)

- **Satellite-Based Augmentations**

- WAAS (3)
- MSAS (2)
- EGNOS (3)
- GAGAN (2)
- SDCM (2)



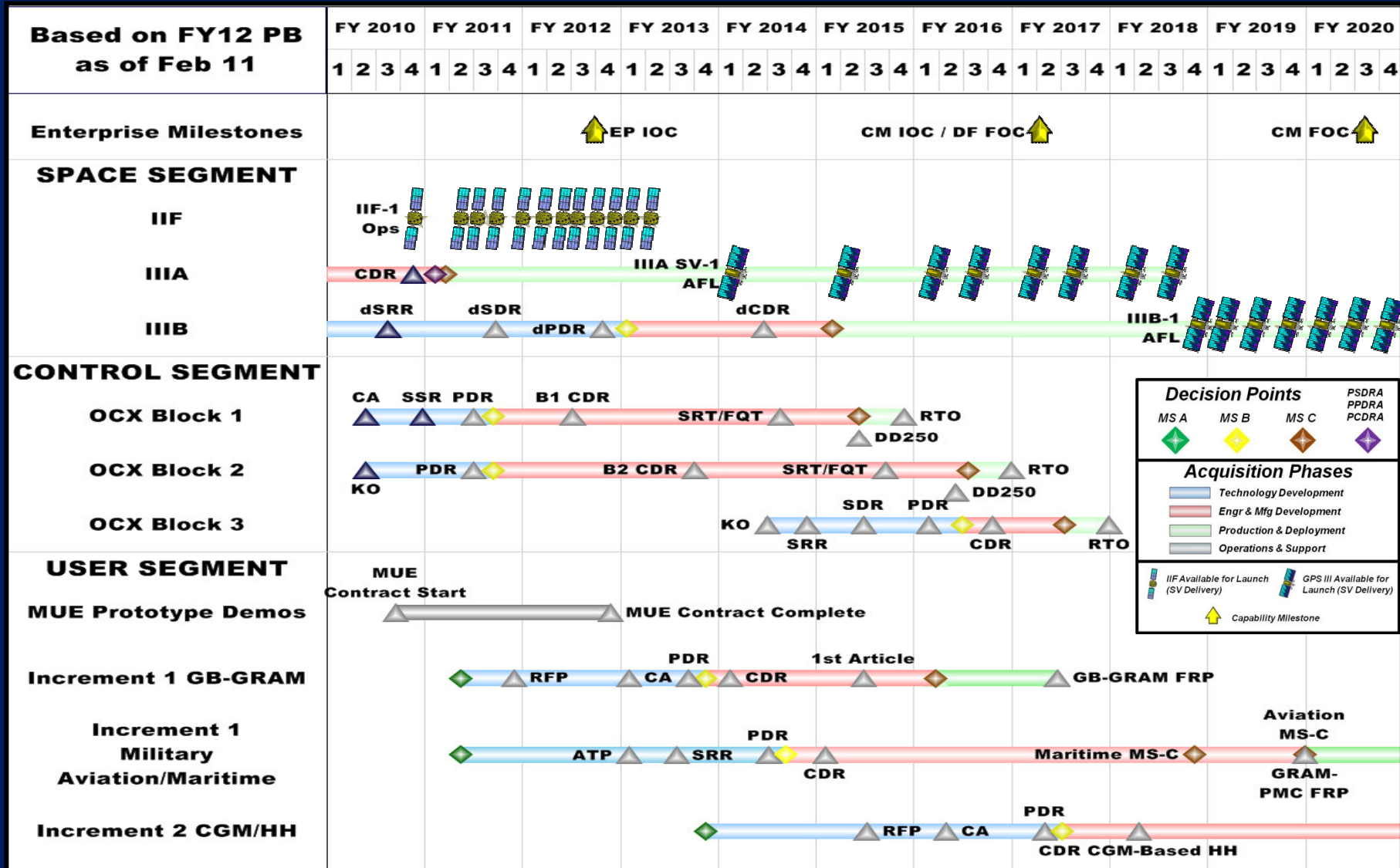
# GPS Constellation Status

- Constellation Status: 35 vehicles on orbit
  - 31 operational
  - Three SVs currently being maintained by LADO (SVNs 32, 35, 37)
  - SVN 49 currently set unhealthy
  - IIF-2 (SVN-63) Launch => NET 23 Jun 11
- On-Orbit Metrics / Parameters:
  - Average Operational SV (II/IIA/IIR) Life to Date => **10.56 Yrs**
  - 21 On-Orbit Satellites Have Surpassed 7.5 Year Design Life
  - SVN-23 (IIA) Oldest Operational SV On-Orbit at **20.13 Yrs**
  - Constellation Mix:
    - 14 Remaining GPS IIAs
    - 12 GPS IIRs
    - 8 GPS IIR(M)s
    - 1 GPS IIF
  - Approved GPS SV Mean Life Estimate (MLE) (Apr 10):
    - GPS IIA => 16.7 yrs
    - GPS IIR => 14.8 yrs
    - GPS IIR(M) => 10.3 yrs
    - GPS IIF (pre-launch) => 11.2 yrs
    - GPS IIIA (pre-launch) => 13.2 yrs
    - GPS IIIB, C (pre-launch) => 13.2 yrs





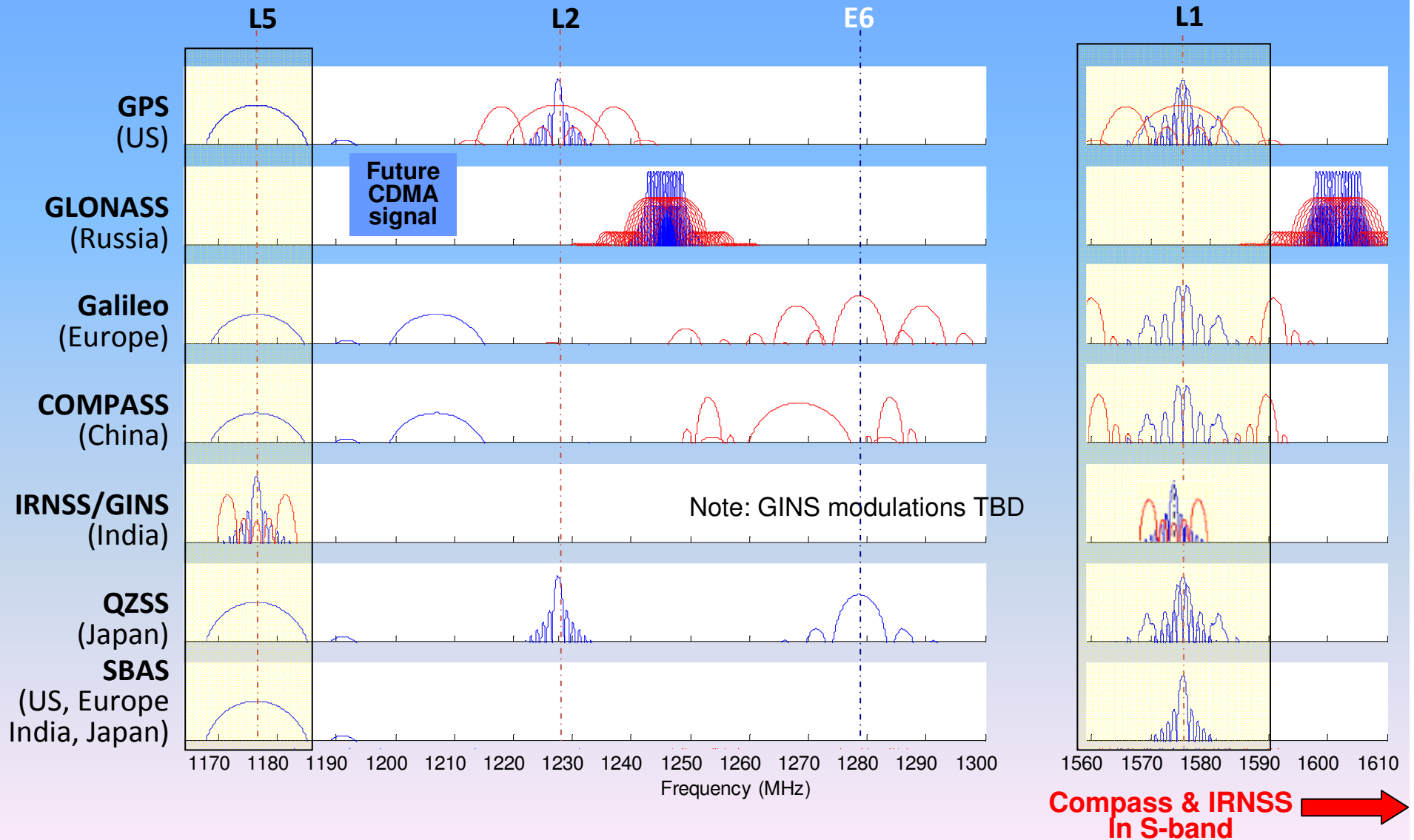
# GPS Enterprise Schedule



Status through: 16 February 2011



# Current International Signal Plans





# Tomorrow's Challenge



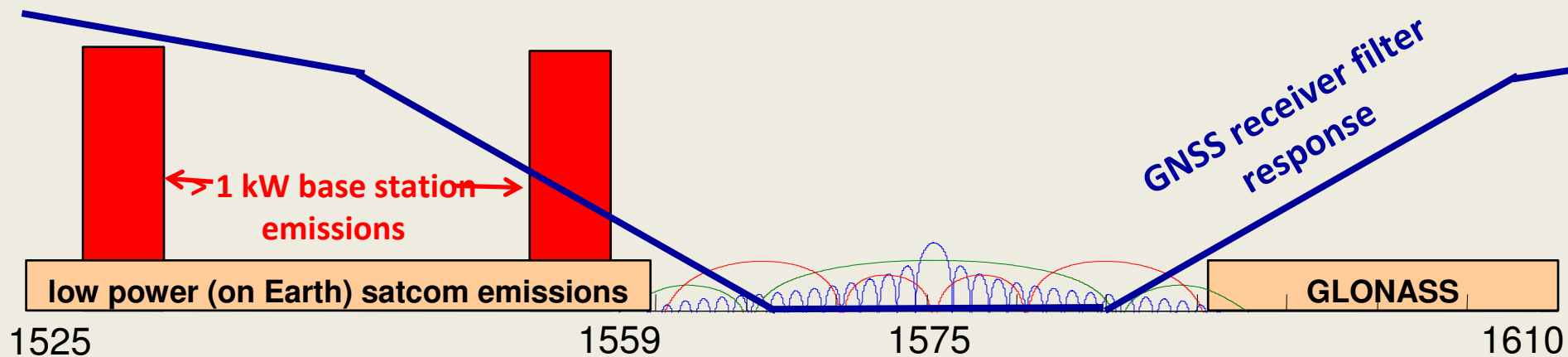


# Illustration of Concerns with LightSquared

Situation before LightSquared



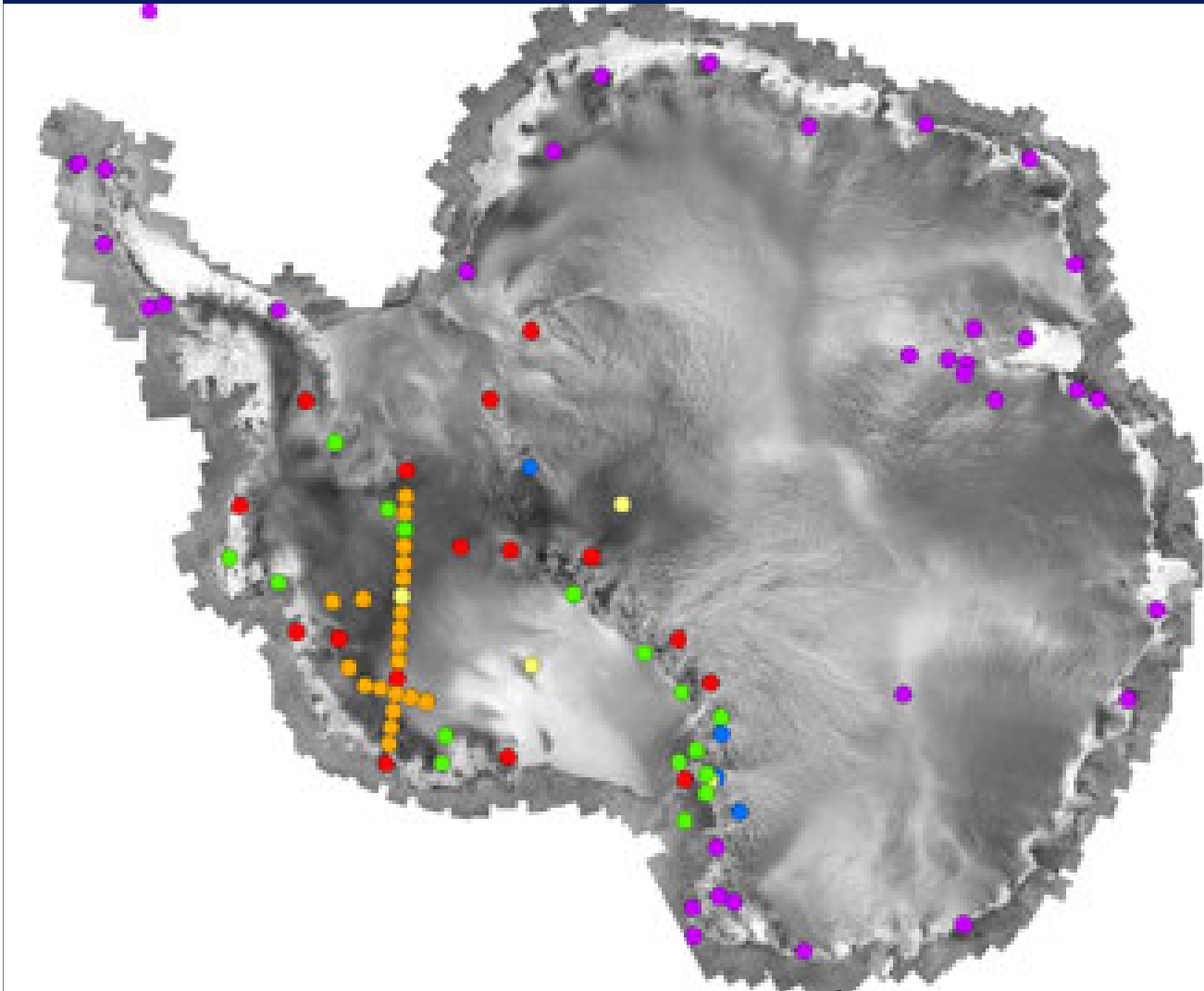
Situation with LightSquared





# POLENET GNSS and Seismic Sites

(as of March 2011)



Blue dots – GNSS

Yellow dots – seismic

Red dots - GNSS &  
seismic

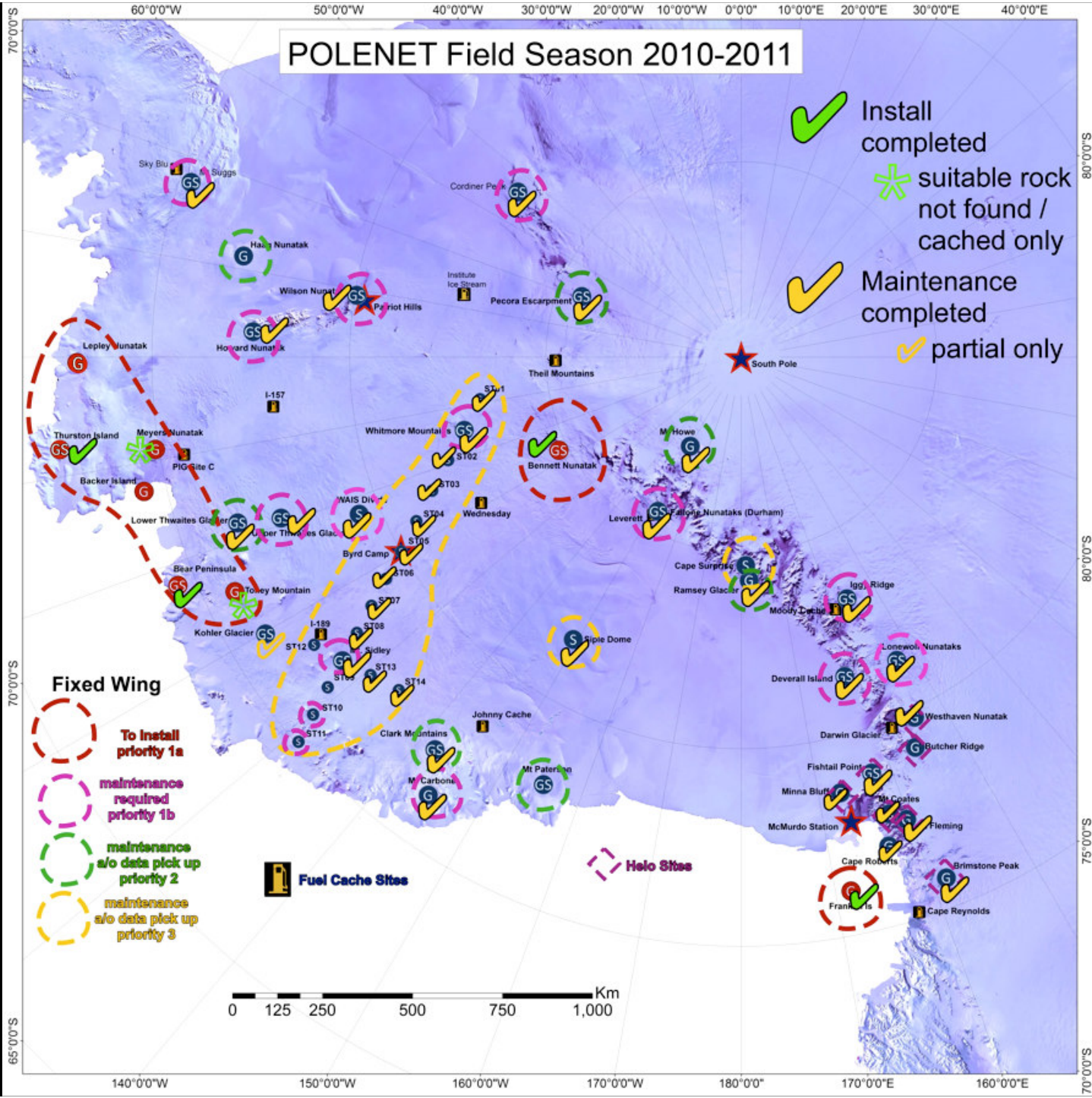
Green dots - “IPY only”  
GNSS

Orange dots – “IPY”  
seismic

Purple dots - GNSS  
and/or seismic -  
International  
collaboration

# POLENET Field Season 2010-2011

-  Install completed
-  suitable rock not found / cached only
-  Maintenance completed
-  partial only



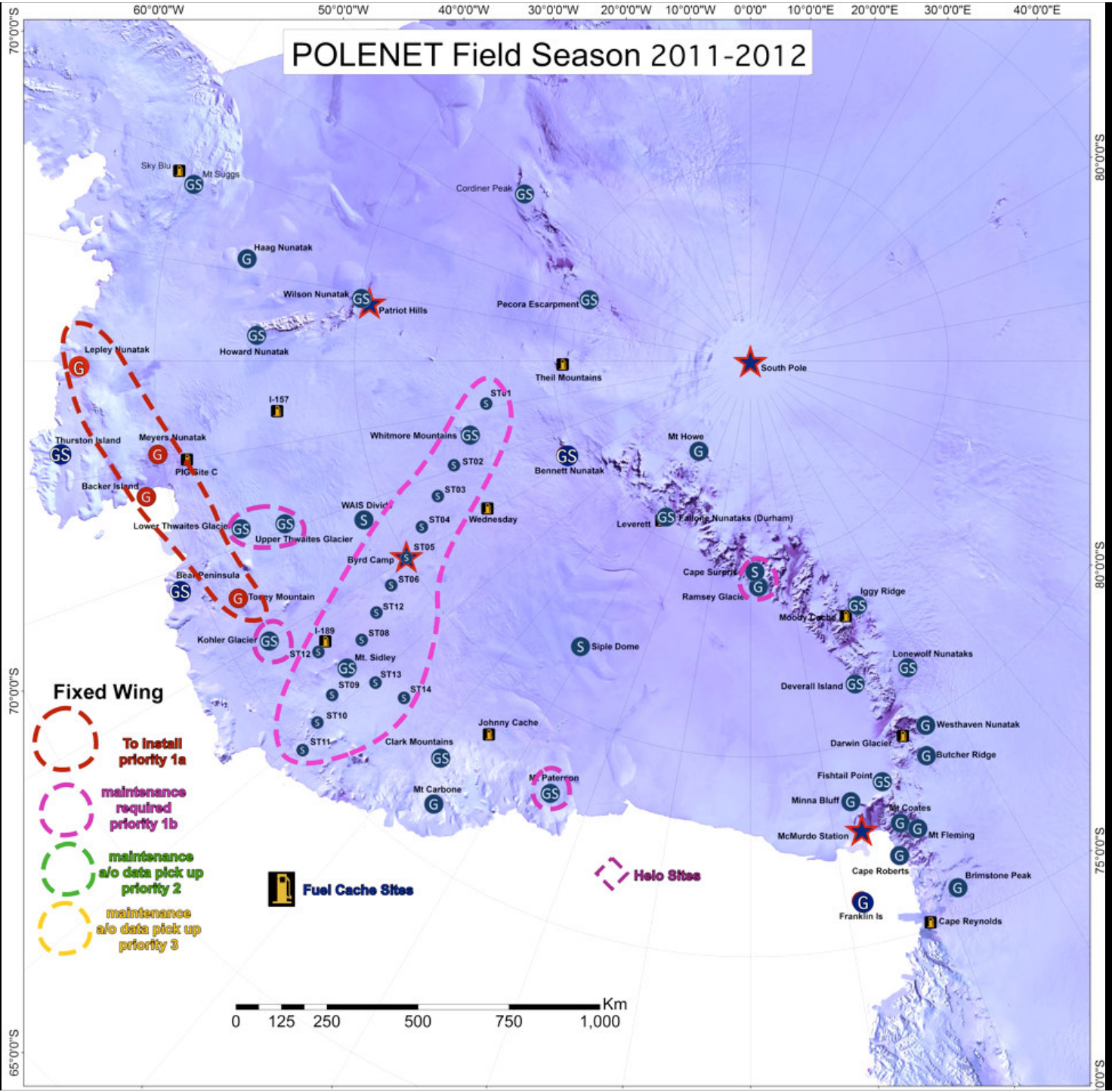
- Fixed Wing**
-  To install priority 1a
  -  maintenance required priority 1b
  -  maintenance s/o data pick up priority 2
  -  maintenance s/o data pick up priority 3

 Fuel Cache Sites

 Helo Sites



# POLENET Field Season 2011-2012



## Fixed Wing

- To install priority 1a**
- maintenance required priority 1b**
- maintenance a/o data pick up priority 2**
- maintenance a/o data pick up priority 3**

**Fuel Cache Sites**

**Helo Sites**



# Future of POLENET Program

- **Present**

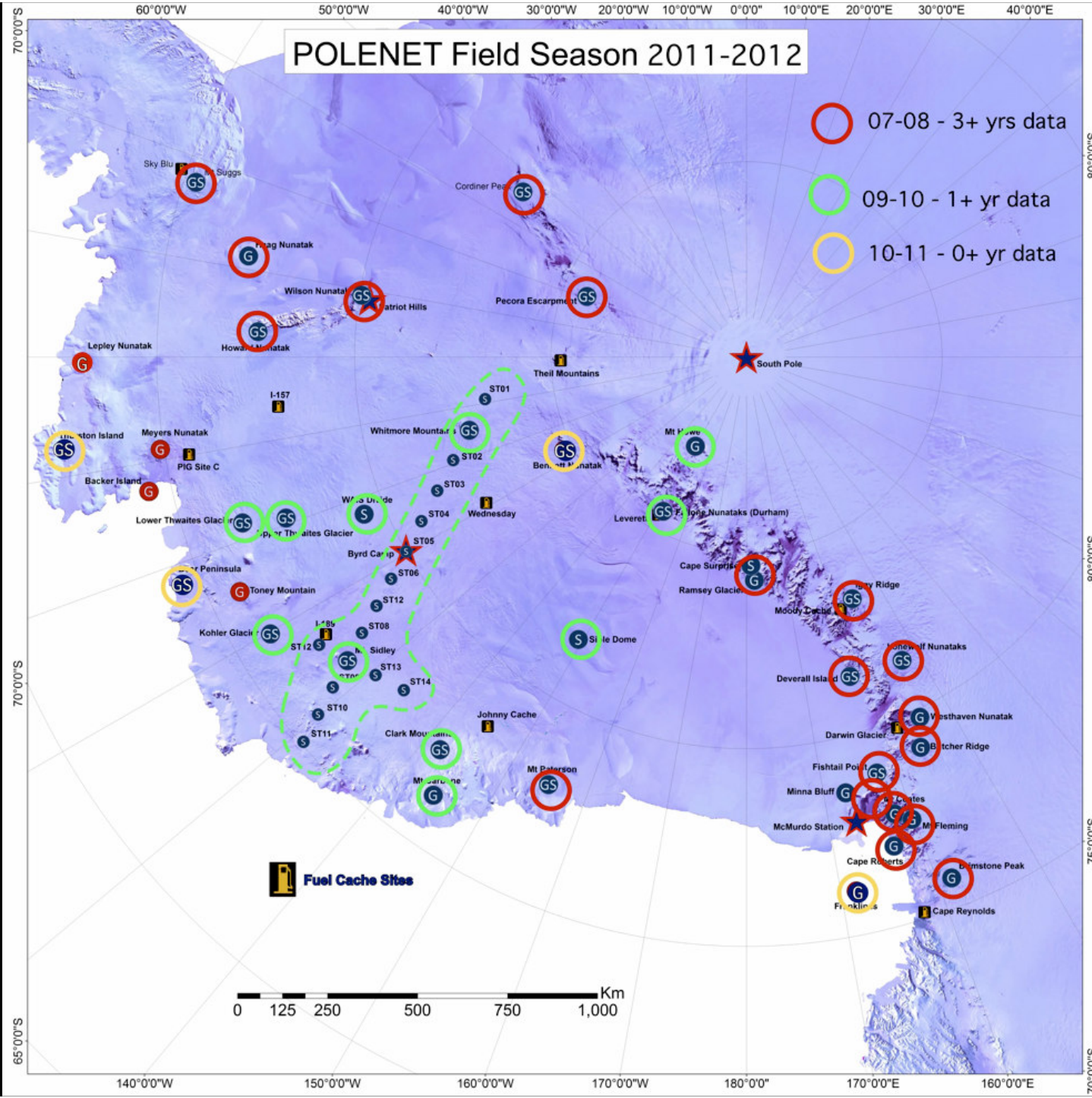
- Final field season for current funded project is Austral Summer of 2011-2012

- **Planning underway to prepare funding proposal for next phase of U.S. POLENET**

- Due to NSF Office of Polar Programs: **June 2011**
- 3 to 5 years
  - hopefully gain approval for a minimum of 4 years
- Possibly may delay until **September 2011**
  - Delayed submission of proposal would allow for consideration of outcome of discussions on future of POLENET at ISAES 2011, Edinburgh, Scotland, **10-16 July 2011**
  - **Consider for proposal, other research benefits from “continuous” GNSS observations**
    - Such as support for GWSWF research objectives

# POLENET Field Season 2011-2012

- 07-08 - 3+ yrs data
- 09-10 - 1+ yr data
- 10-11 - 0+ yr data



**AIRPORT**

MAP HOTEL  
SPOT NAME

- ☒ Best Value Inn & Suites Portland
- ☒ Best Western Pony Soldier Inn - Airport
- ☒ Comfort Inn
- ☒ Comfort Suites - Airport
- ☒ Country Inn & Suites Portland Airport
- ☒ Courtyard by Marriott - Portland Airport
- ☒ Embassy Suites Hotel Portland Airport
- ☒ Fairfield Inn by Marriott Portland Airport
- ☒ Hampton Inn - Portland Airport
- ☒ Hilton Garden Inn - Portland Airport
- ☒ Holiday Inn Express Hotel & Suites - Portland Airport
- ☒ Holiday Inn Portland Airport
- ☒ La Quinta Inn & Suites - Portland Airport
- ☒ Quality Inn - Portland Airport
- ☒ Radisson Hotel Portland Airport
- ☒ Ramada Inn & Suites Portland Airport
- ☒ Sheraton Portland Airport Hotel
- ☒ Shilo Inn Suites Hotel - Portland Airport
- ☒ Clarion Inn at the Portland Airport
- ☒ Springhill Suites by Marriott Portland Airport
- ☒ Super 8 Motel - Airport
- ☒ Travelodge Portland Airport

**JANTZEN BEACH**

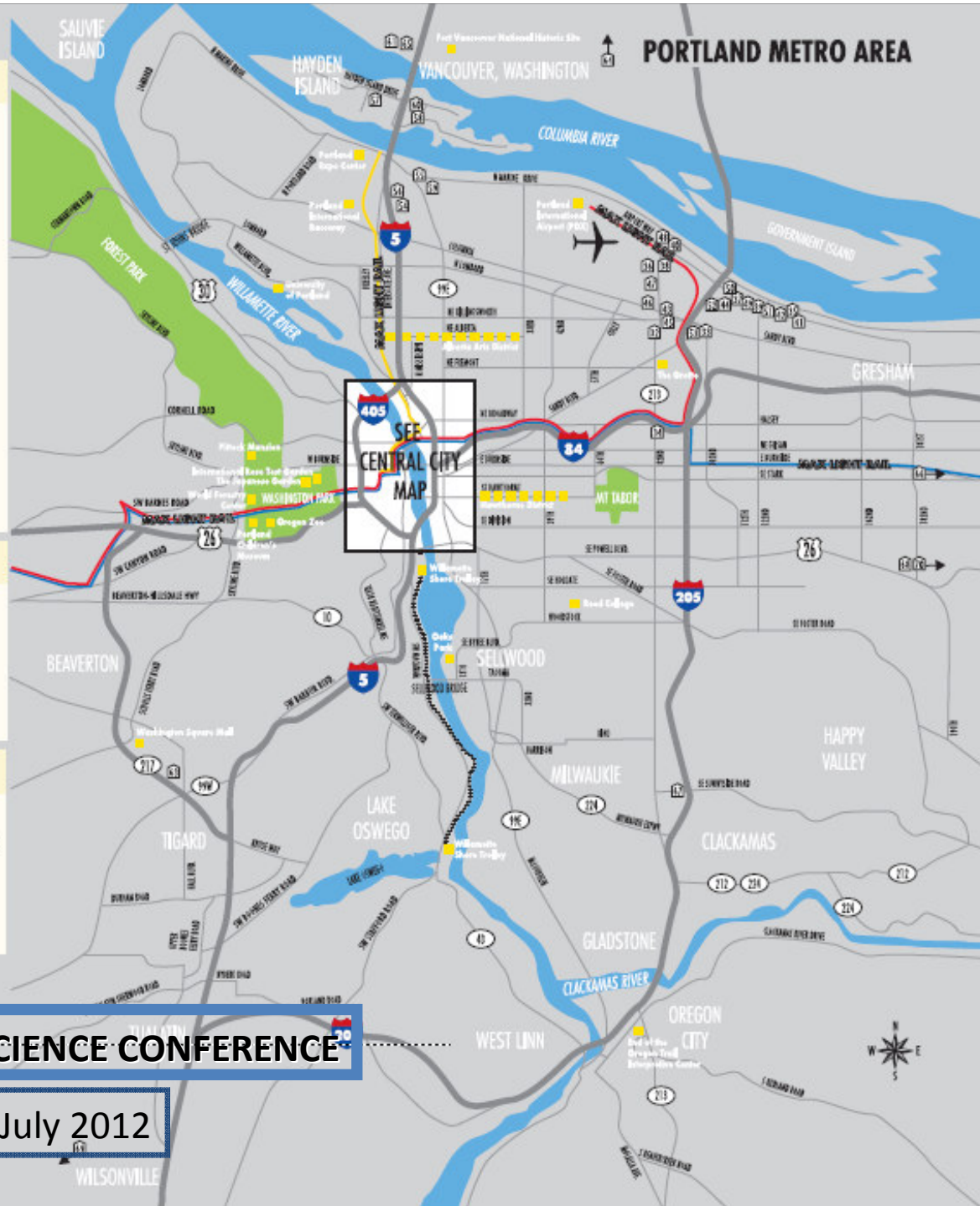
MAP HOTEL  
SPOT NAME

- ☒ Best Western Inn at the Meadows
- ☒ Courtyard by Marriott Portland North Harbour
- ☒ Days Inn Portland North
- ☒ Holiday Inn Express Hotel & Suites - Jantzen Beach
- ☒ Oxford Suites Portland
- ☒ The Portlander Inn & Marketplace
- ☒ Red Lion Hotel on the River
- ☒ Red Lion Hotel Vancouver at the Quay

**METRO PORTLAND REGION & BEYOND**

MAP HOTEL  
SPOT NAME

- ☒ Embassy Suites Portland Washington Square
- ☒ The Heathman Lodge
- ☒ Hilton Vancouver Washington & Vancouver Convention Center
- ☒ Holiday Inn Portland Gresham
- ☒ Monarch Hotel & Conference Center
- ☒ The Resort at The Mountain
- ☒ Salishan Spa & Golf Resort
- ☒ Timberline Lodge



**SCAR 2012 OPEN SCIENCE CONFERENCE**

13-20 July 2012

# Thank you



## POLENET (2005 version?)

The Polar Earth Observatory Network, or POLENET, is aimed at observing the Antarctic glaciologic and geologic system using a multidisciplinary and internationally-coordinated approach. An observatory-style backbone network of co-located, continuously-recording GNSS and broadband seismic sites. The co-location of GNSS and seismic sensors provides important science synergies and significant logistical advantages.

The cooperative program allowed development and deployment of the next-generation power and communication systems optimized for remote deployments in extreme environments.

In order to refine estimates of recent ice mass change of the West Antarctic Ice Sheet, we will measure isostatic rebound with GNSS, constrain mantle rheology through seismic studies, and dramatically improve continental-scale rebound model predictions used to correct ice mass trends derived from satellite altimetry and time-varying gravity.

Both the viscoelastic and elastic response from mass change can be modeled from continuous GNSS measurements, allowing for better estimates of Antarctica's contribution to global sea level change.

Seismological investigations, integrated with results from the geodetic studies, will provide first-order constraints on geological/tectonic parameters important for understanding ice sheet dynamics in West Antarctica. New seismic data will be used to develop high-resolution seismic tomographic images, seismic receiver functions will be used to map the sediment thickness distribution beneath the ice sheet, and recordings of glacial earthquakes will help to constrain short-term slip events that are important for understanding ice sheet dynamics.