The IPY 2007 – 2008

Contributions by Space Agencies and Expected Observational Legacies

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OBJECTIVES OF THE IPY 2007-2008

IPY 2007-2008 should be an intensive and internationally coordinated campaign of high quality research activities and observations in the polar regions that would not otherwise be undertaken. IPY 2007-2008 is intended to lay the foundation for major scientific advances in the knowledge and understanding of the nature and behaviour of the polar regions and their role in the functioning of the planet.

Timeframe: 1 March 2007 to 1 March 2009

IPY Space Task Group (1)

The contributions of the Space Agencies were coordinated by the IPY Space Task Group (STG). The STG was tasked with addressing how to meet the space observation requirements of IPY. It is comprised of nominated representatives of 13 Space Agencies

(ASI, CNES, CSA, CMA, DLR, ESA, EUMETSAT, INPE, JAXA, , NASA, NOAA, ROSHYDROMET, USGS).

Secretarial support is provided by WMO.

IPY Space Task Group (2)

The basis of the work has been consolidated observational requirements as defined through

- Space Agencies Announcements of Opportunities,
- GIIPSY (IPY Polar Snapshot Project)
- IGOS-P Cryosphere Theme,
- WCRP CliC,

and other institutional requirements obtained via the IPY.

The STG held up to now 4 meetings and 2 SAR/InSAR coordination workshops.

IPY Space Task Group (3)

The requirements were met by the Space Agencies by establishing IPY Data Portfolios. The access was provided online by the IPY web site.

In addition the STG established 4 scientific **firsts** and one additional goal to be accomplished by the Space Agencies during IPY:

For the first time,

1) pole to coast multi-frequency InSAR measurements of ice-sheet surface velocity

2) Fine-resolution SAR mapping of the entire Southern Ocean sea-ice cover - for sea ice motion;

3) One complete high resolution visible and thermal IR (Vis/IR) snapshot - for ice sheet, circumpolar snow cover and permafrost;

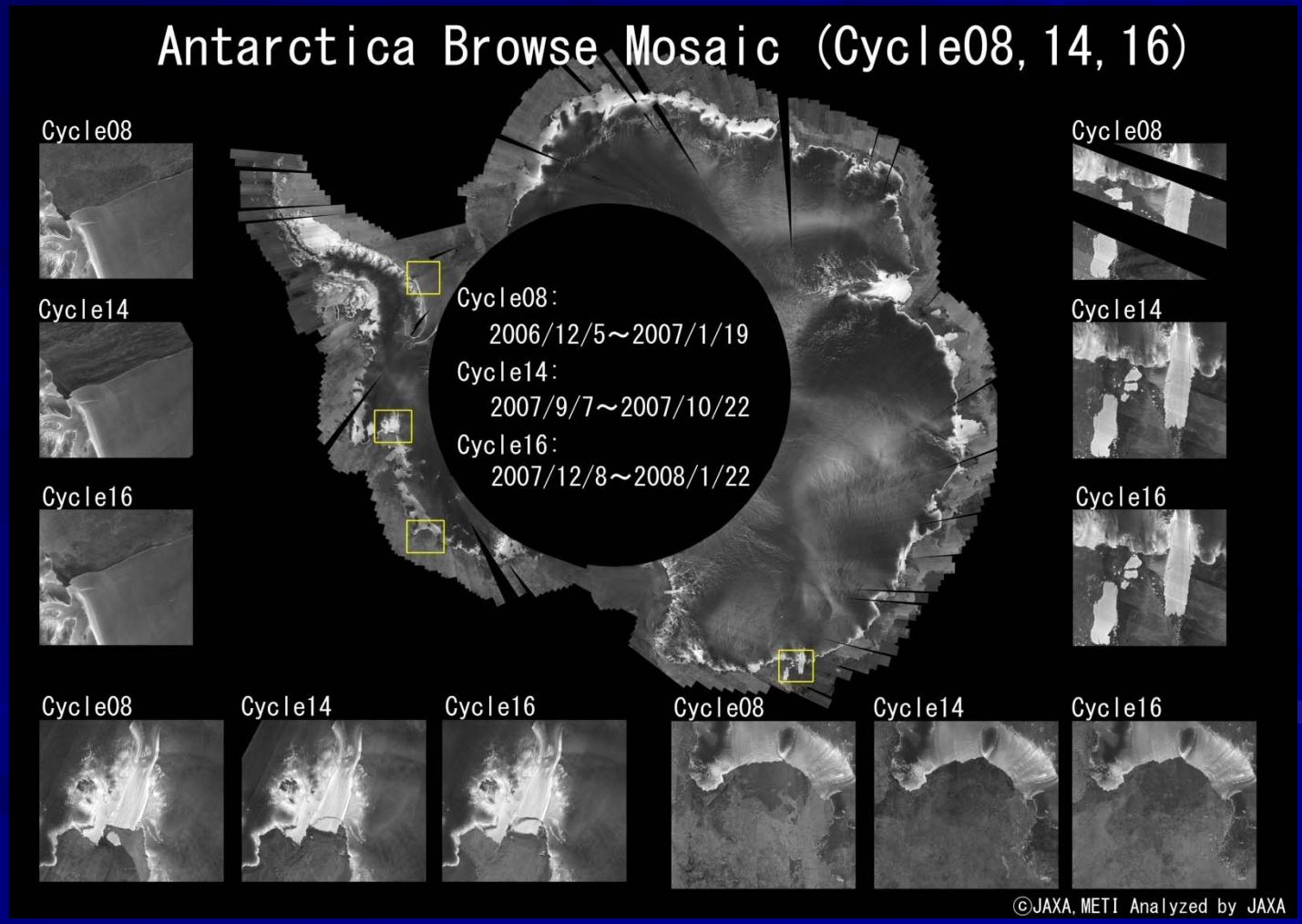
4) Pan-Arctic high and moderate resolution Vis/IR snapshots - for lake and river freeze-up and break-up.

Additional goal:

Atmospheric Dynamics and Composition

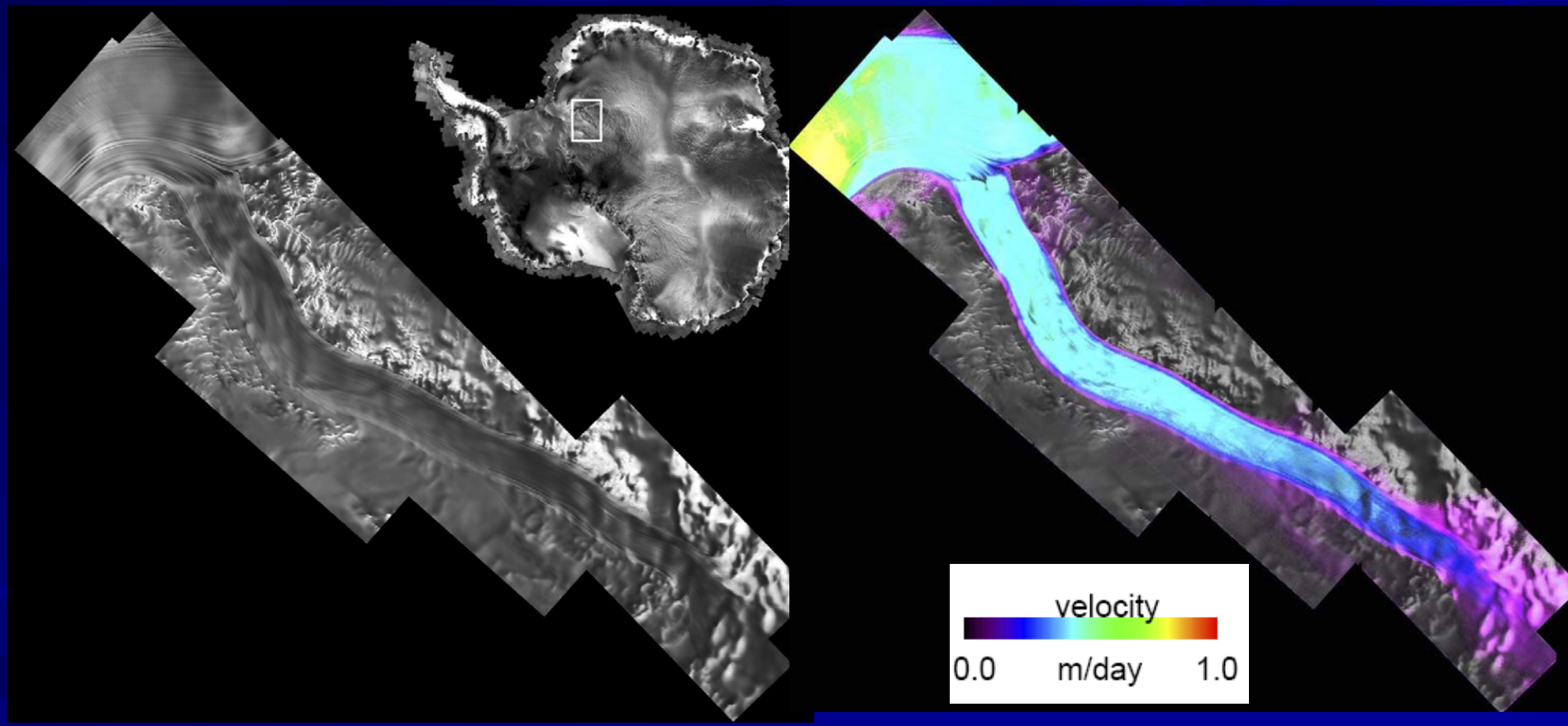
Pole to coast multi-frequency InSAR measurements of ice-sheet surface velocity

PALSAR – L-band SAR snapshots



Goal: 100 meter spaced Antarctic mosaics twice/year over three years.

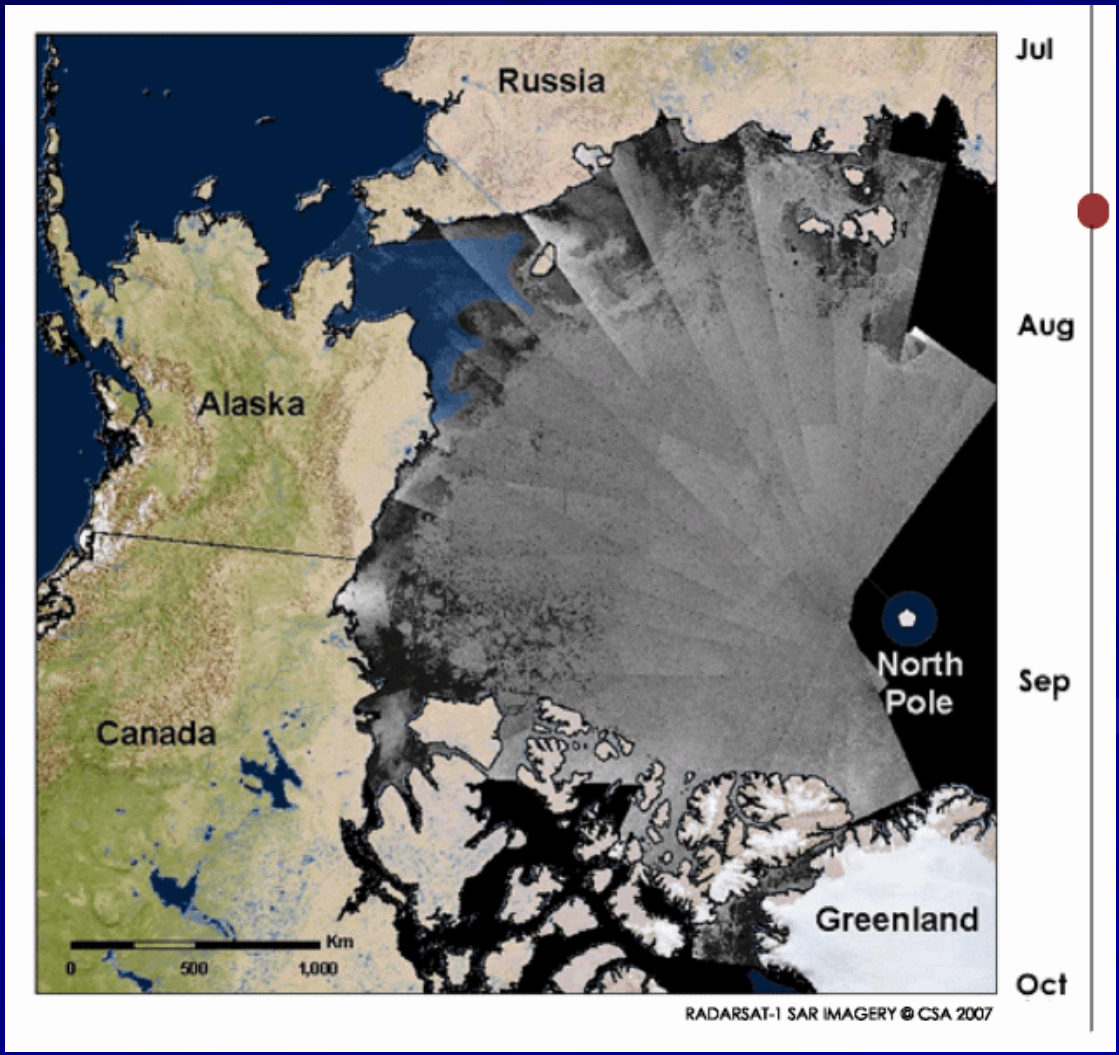
Recovery Glacier – T-SAR-X



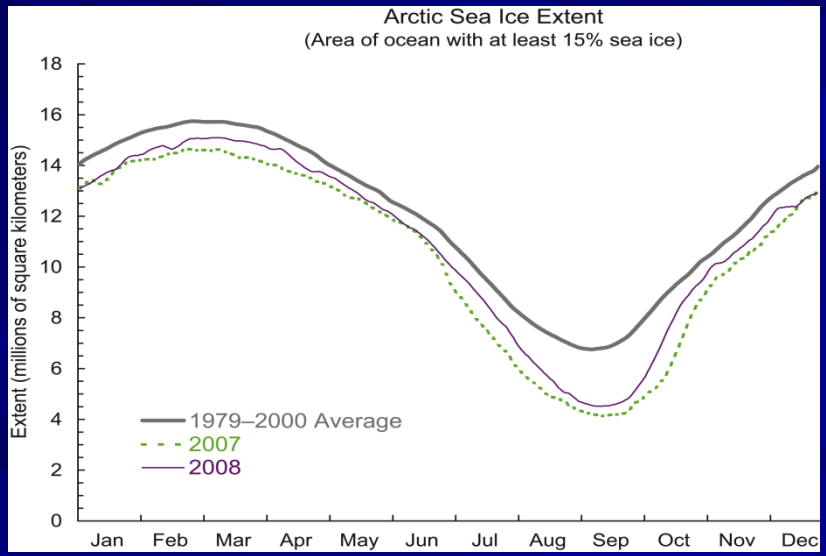
Courtesy DLR

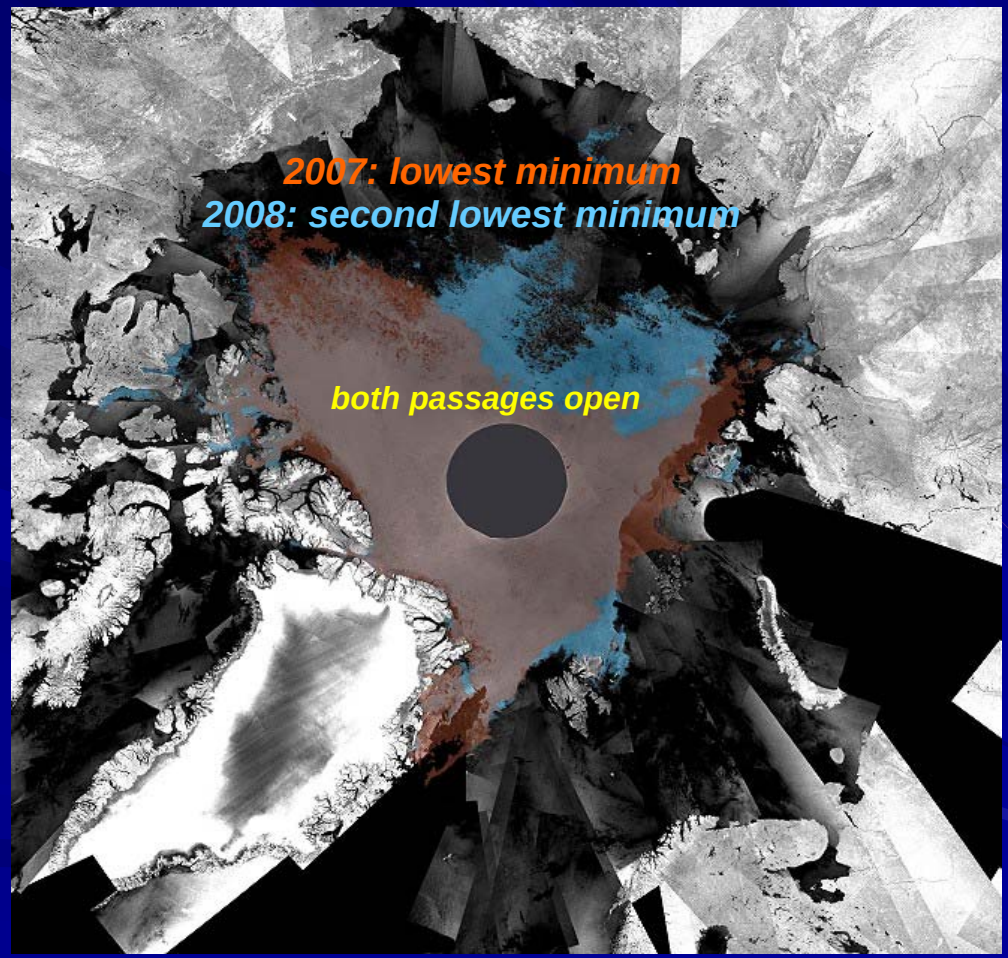
2007 Arctic Sea Ice Extent

Record Minimum captured by CSA RADARSAT-1 (Goal 1)



2007/8 Lowest Arctic Sea Ice Extend

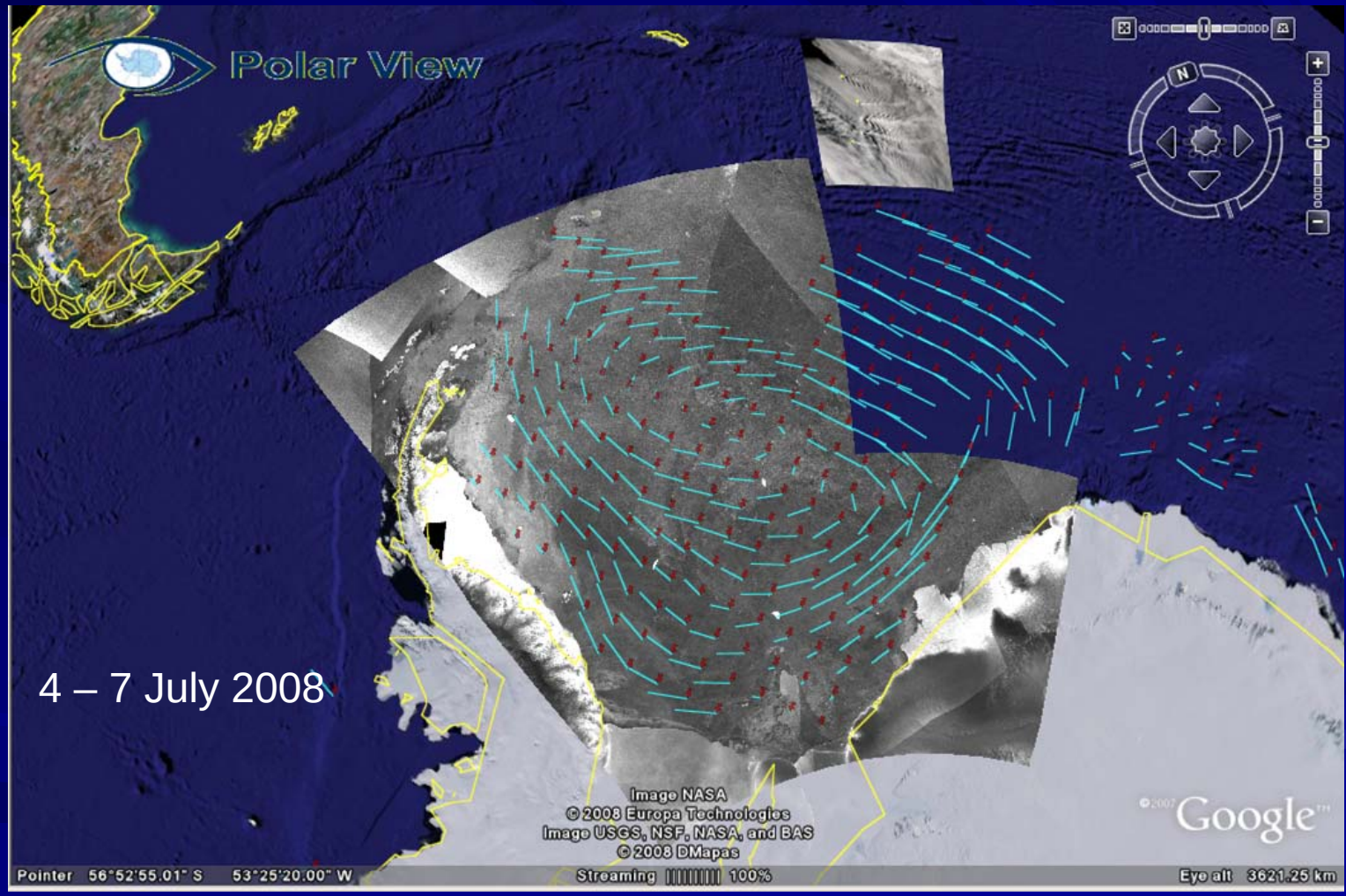




ESA - Envisat

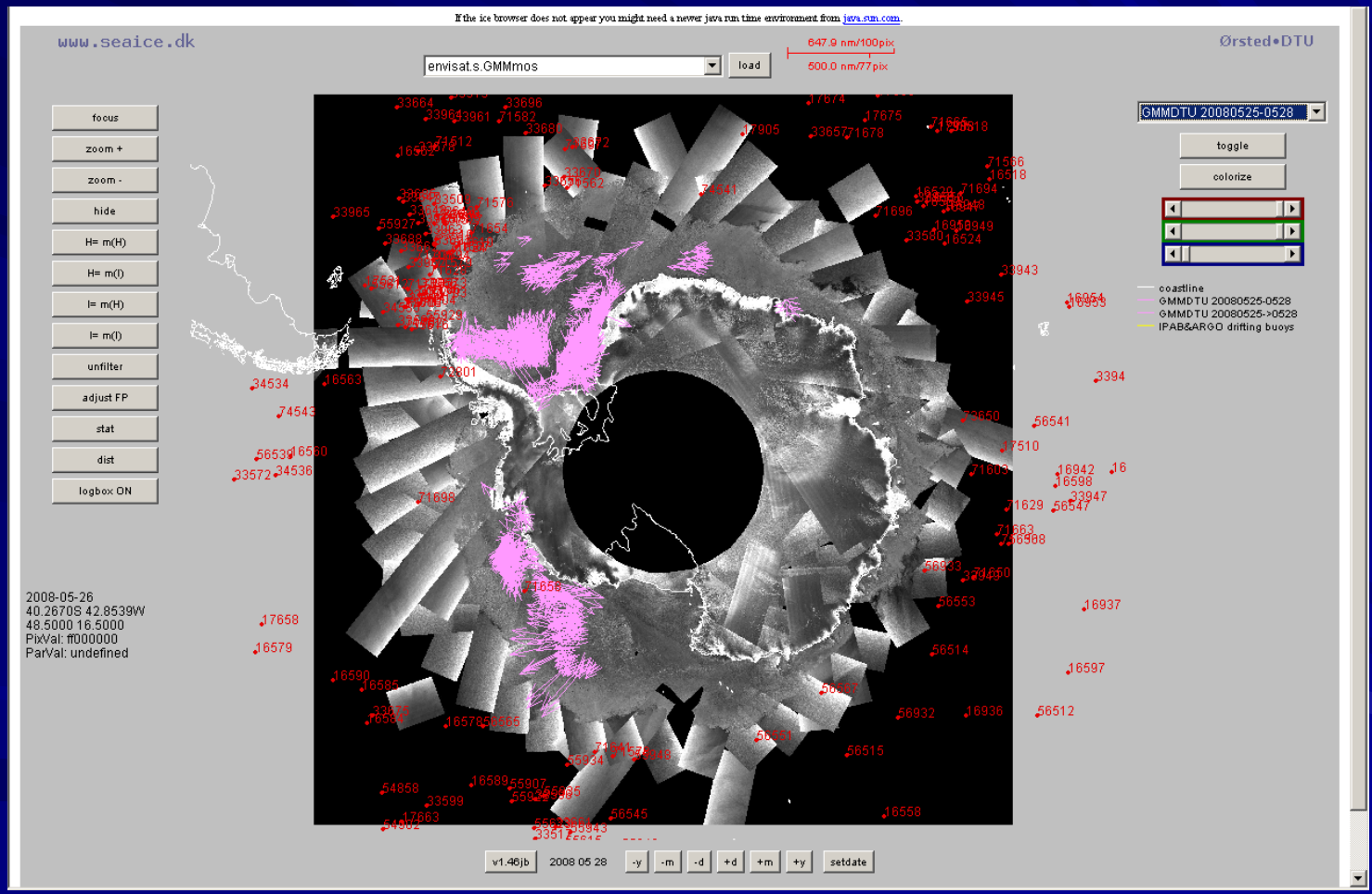
Fine-resolution SAR mapping of the entire Southern Ocean sea-ice cover - for sea ice motion

Envisat ASAR 3-day Sea Ice Drift



http://www.seaice.dk/polarview/google.s/latest.GMMdrift.kml

Routine Antarctic Sea Ice Drift



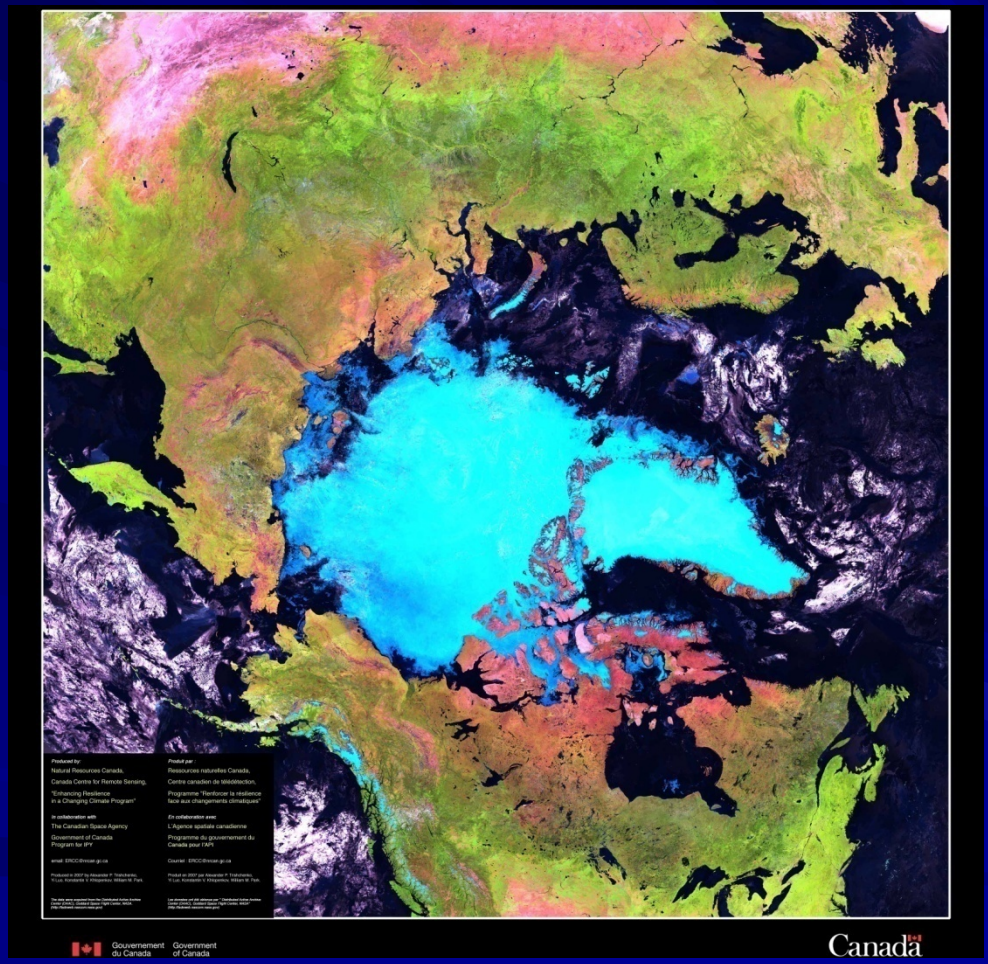
Courtesy DTU – ESA PolarView

One complete high resolution visible and thermal IR (Vis/IR) snapshot - for ice sheet, circumpolar snow cover and permafrost

Arctic Optical Coverage

Envisat - MERIS – 300m optical image of Arctic tundra

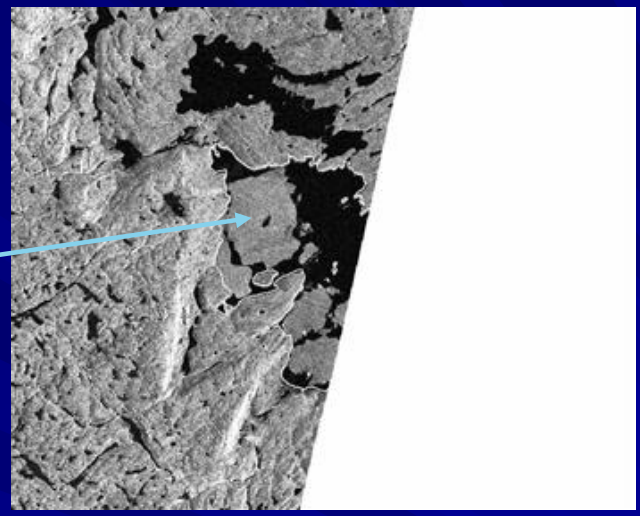
Circumpolar Clear Sky Composites



MODIS Mosaic - Courtesy NRCan & NASA

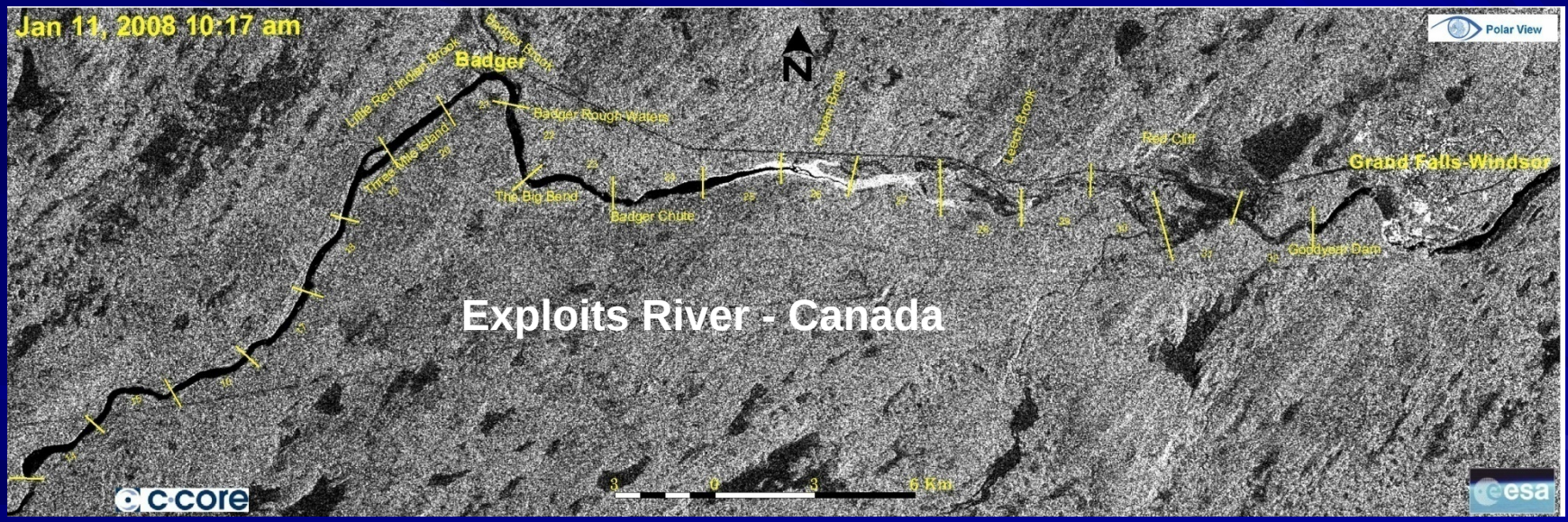
Pan-Arctic high and moderate resolution Vis/IR snapshots – for lake and river freeze-up and break-up

Lake and River Ice Monitoring



Radarsat Image of Tasirjuakuluk for 28 June 2008

River Ice Monitoring(Goal 4)

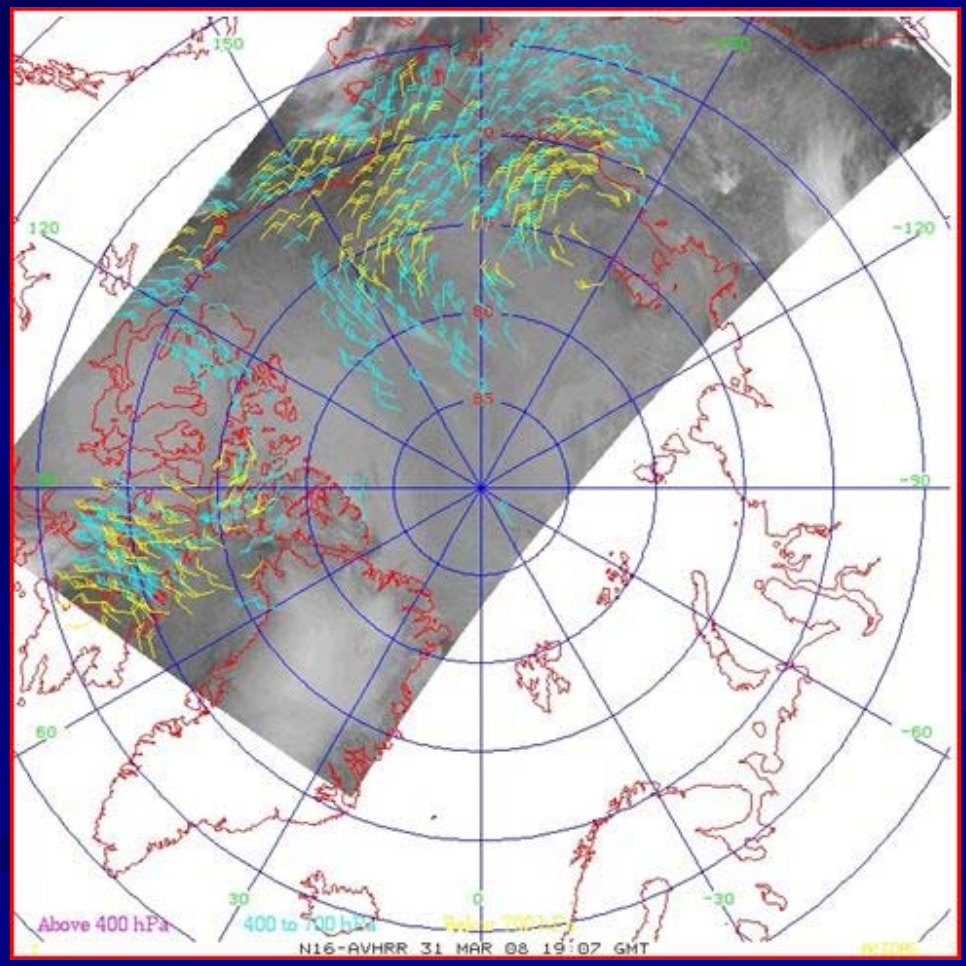


11 Jan. 2008

Courtesy PolarView

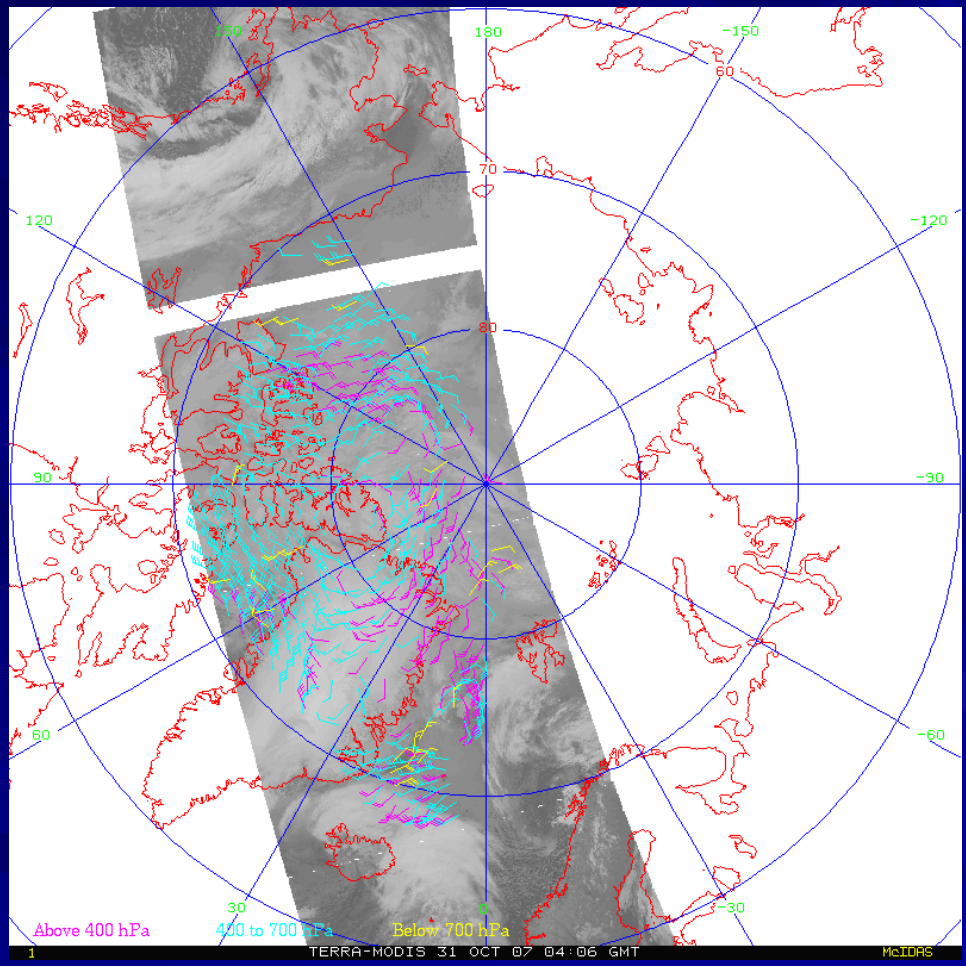
Atmospheric Dynamics and Composition

Atmospheric Winds



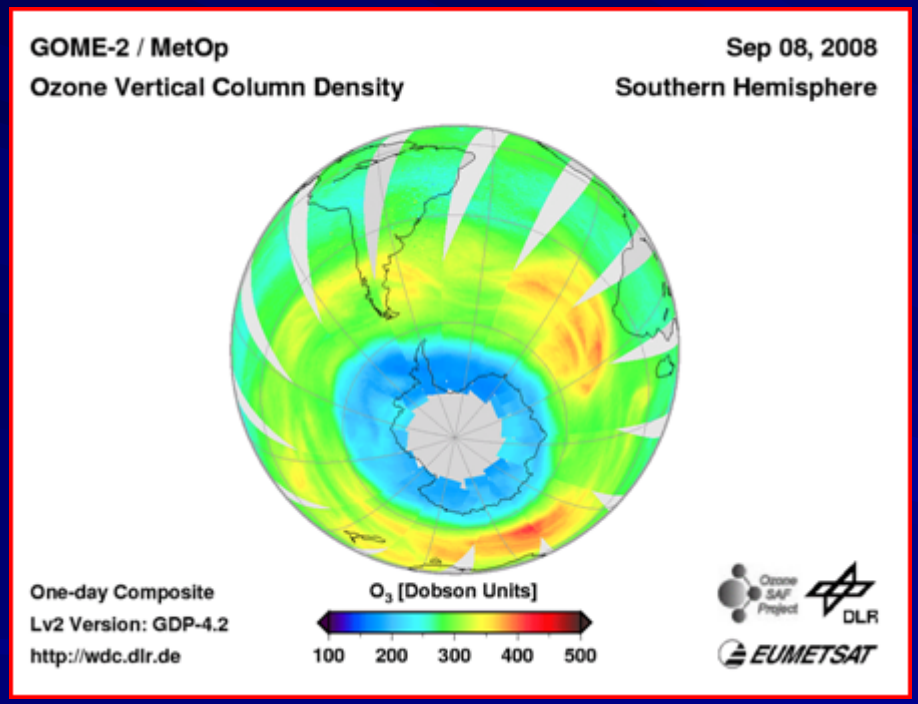
31 March 2007, NOAA-16 Courtesy NOAA/NESDIS

Atmospheric Winds

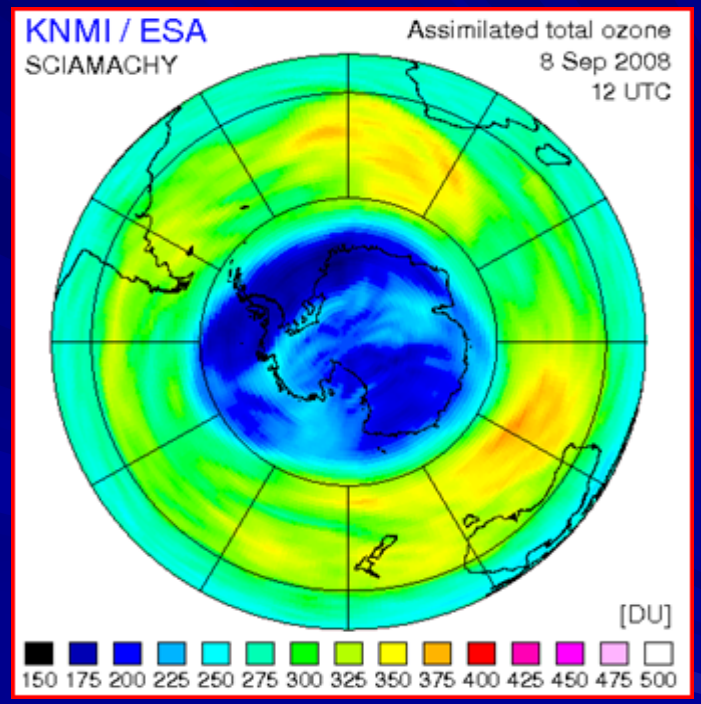


31 Oct. 2007, TERRA-MODIS Courtesy NOAA/NESDIS

Southern Hemisphere Independent Ozone Observations



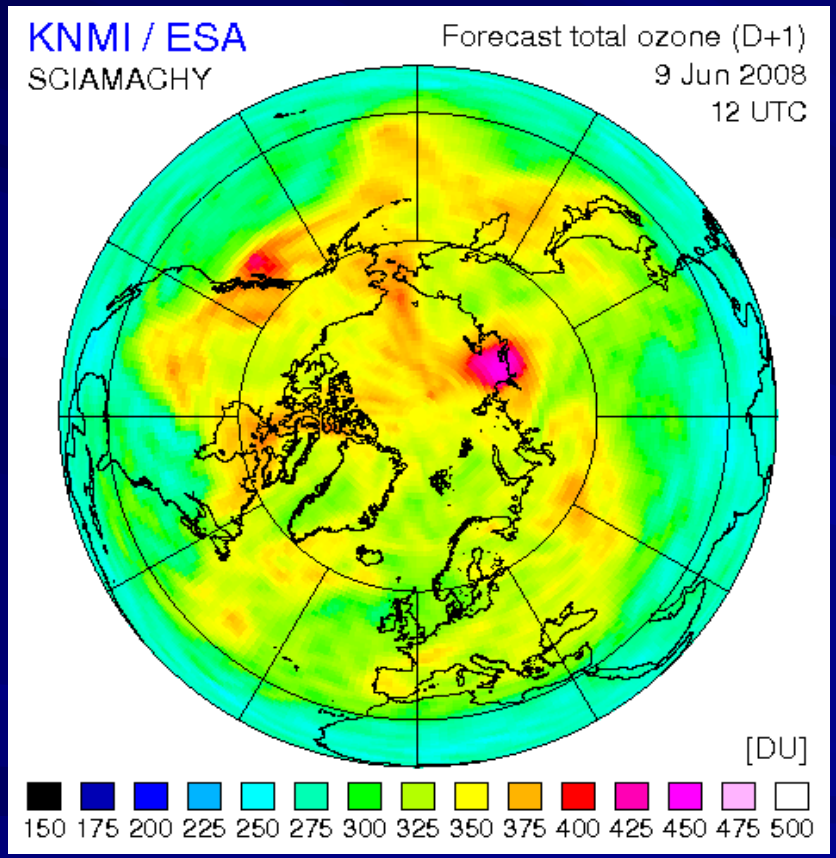
EUMETSAT / DLR

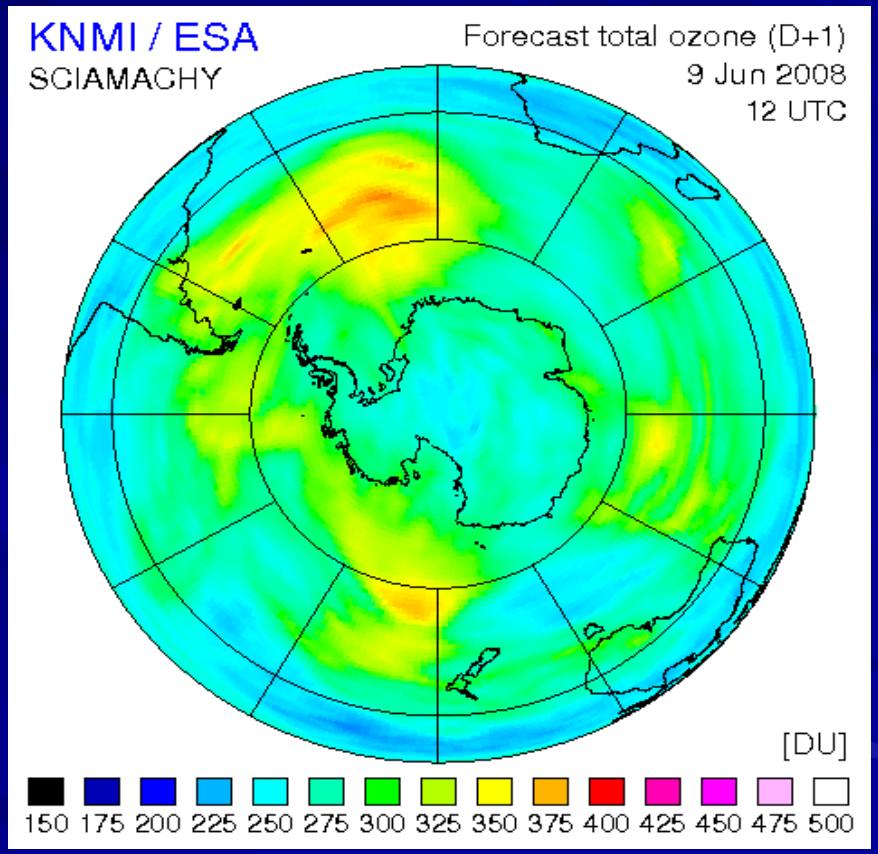


ESA / KNMI

Forecast Total Ozone (D + 1)

based on Envisat Sciamachy data





For Ozone analyses see: http://www.temis.nl/protocols/O3forecast.html

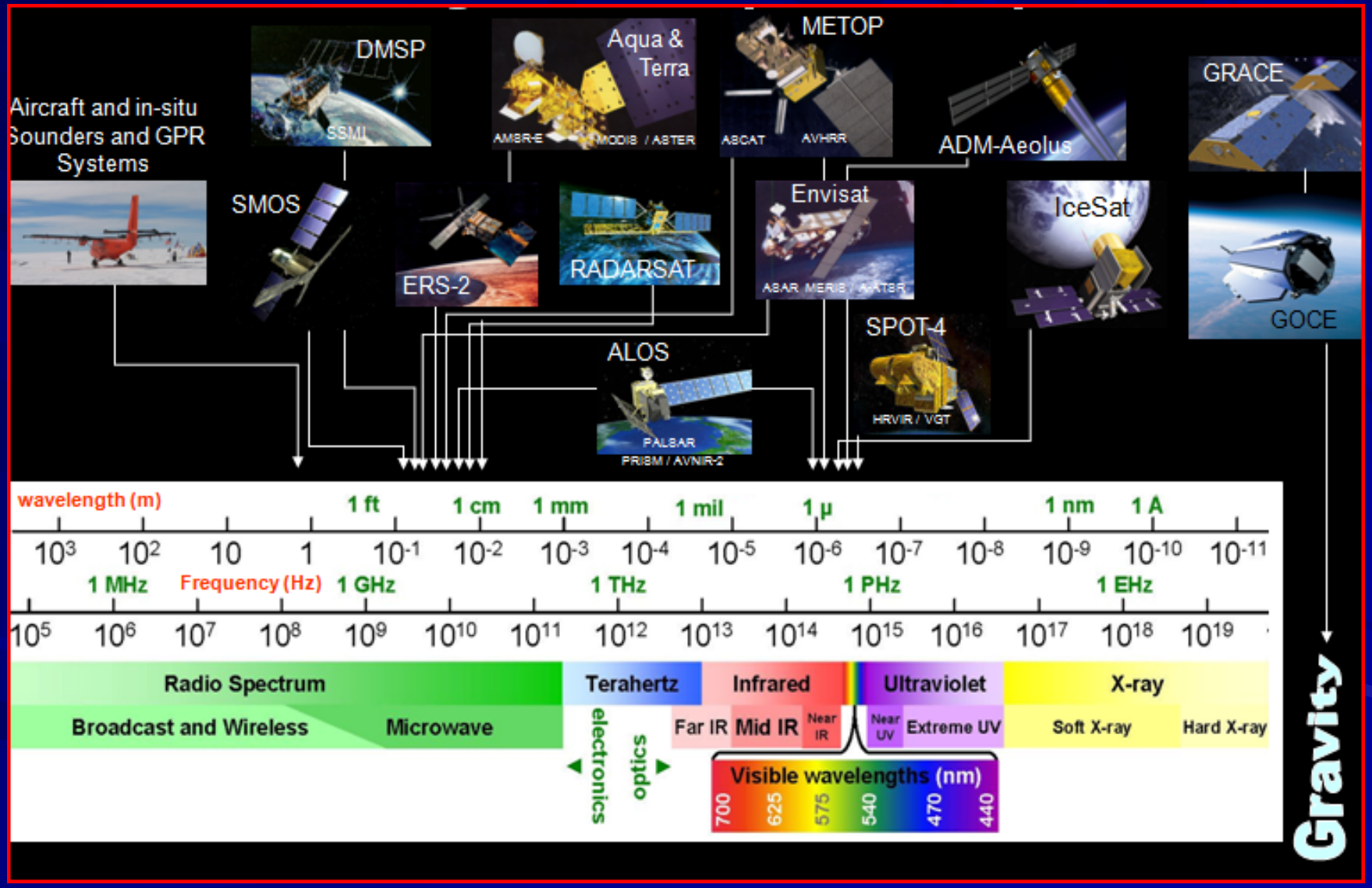
Results (1)

- significant progress achieved during the IPY in response to acquiring comprehensive Arctic and Antarctic snapshots;
- an impressive array of new data products which has been planned, acquired and archived with which to address some of the key scientific goals;

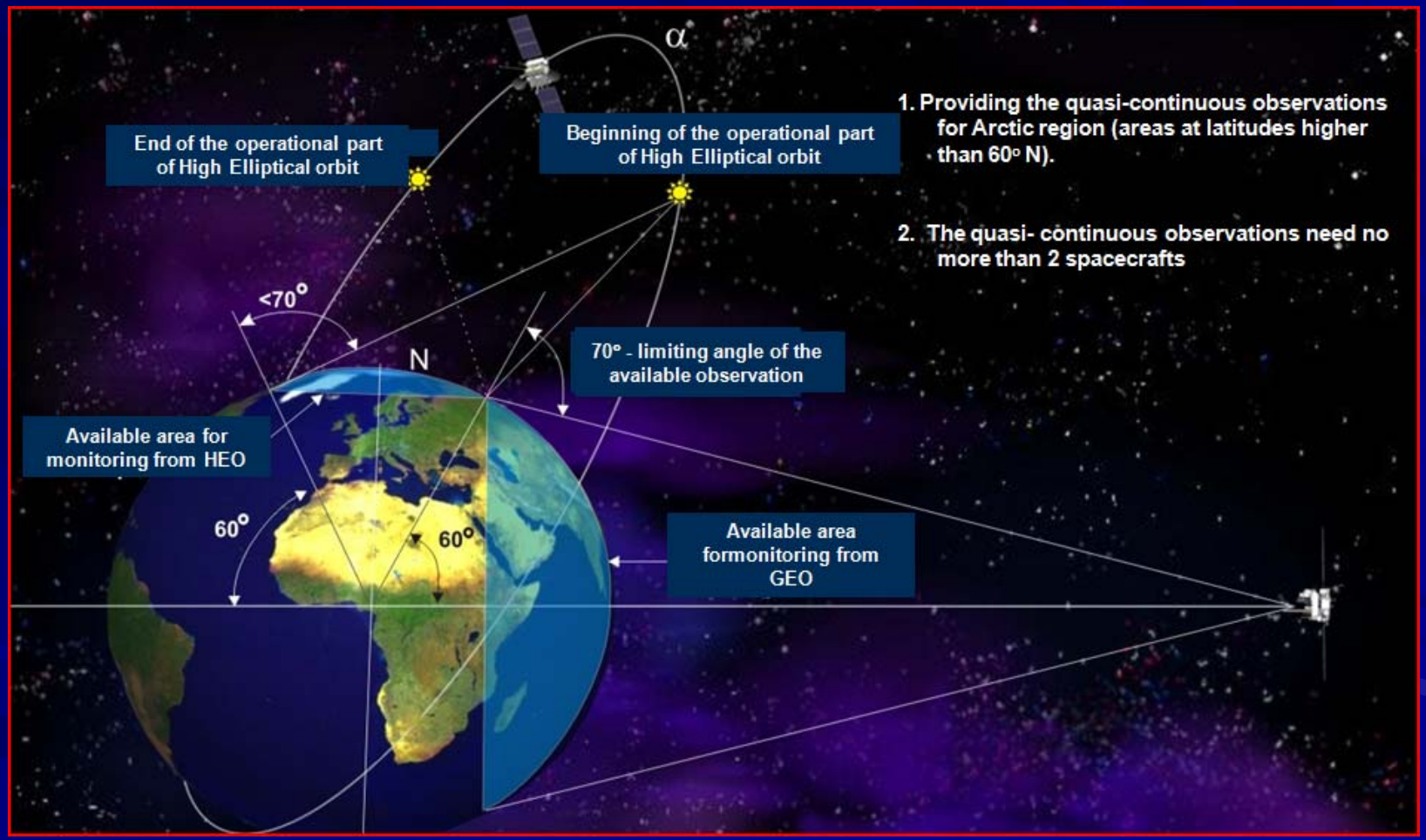
Results (2)

- significant progress achieved in building a space-borne component of the IPY data legacy. The resulting IPY EO data legacy will serve as an invaluable scientific data source for decades to come.
- New missions have been approved and/or started: the Canadian “PCW” and the Russian “Arctica” Satellite System

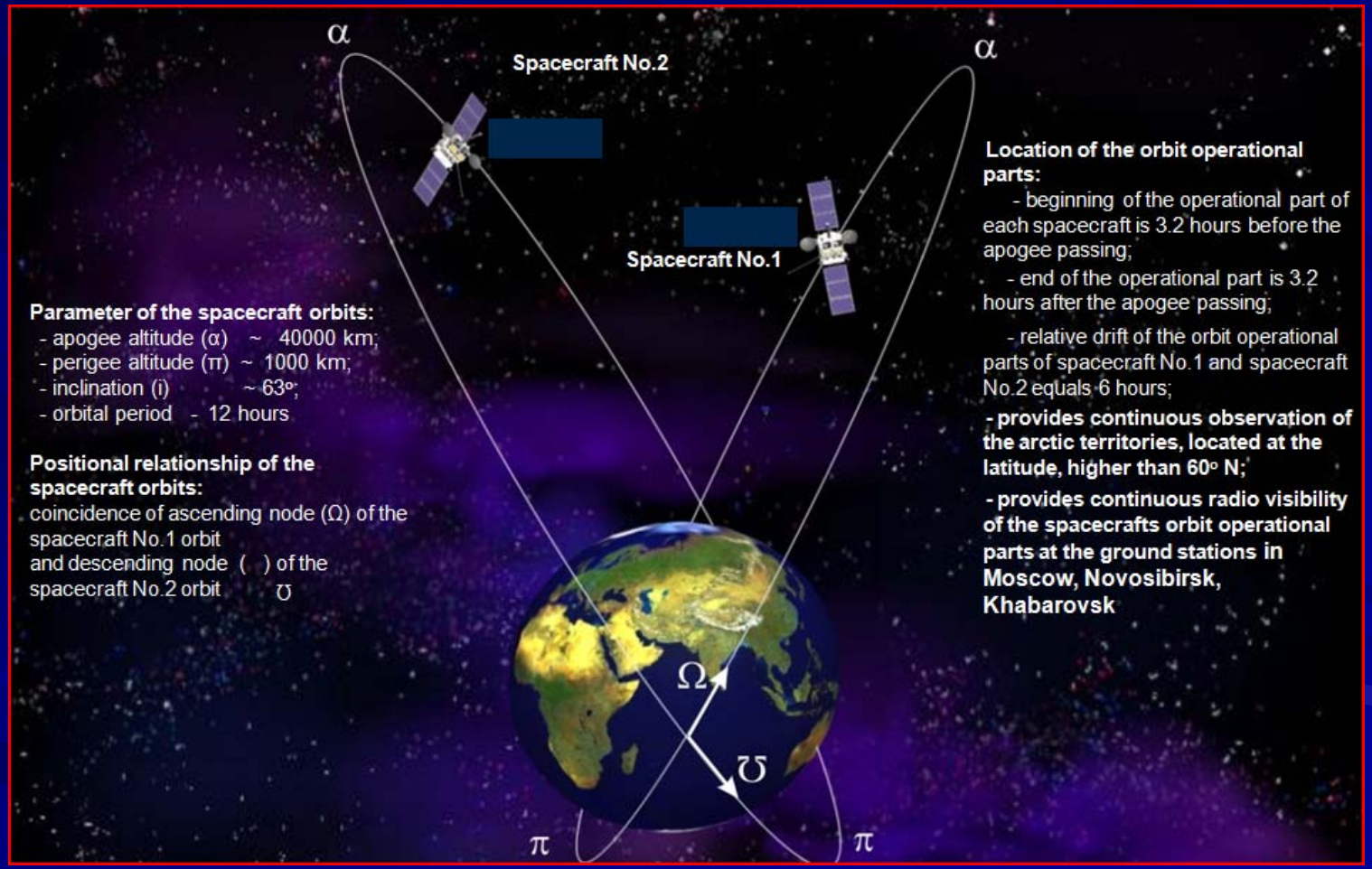
Present Polar Satellite System



High Elliptical Orbits (1)



High Elliptical Orbits (2)



Polar Comm. & Weather (PCW)/ PolarSat Mission (1)

Mission Objectives

- Reliable communications in the high latitudes (North of 70°) to ensure:
  - –Security
  - –Sustainable Development
  - –Support to Northern Communities
  - –Air and Marine Navigation
  - –Arctic Science
- Provide high temporal/spatial resolution meteorological data above 50° N in support of:
  - –Numerical Weather Prediction (short to medium range)
  - –Environmental monitoring, emergency response
  - –Climate monitoring

Polar Comm. & Weather (PCW)/ PolarSat Mission, Canada (2)

Payloads

- Primary
  - 2-way HDR antenna/transponder sub-system (Ka)
  - Imaging Spectroradiometer (20 channels, 0.5-1 km VIS, 2 km IR)
  - Space weather suit of instruments
- Secondary
  - Scientific instruments:
    - Broadband radiometer
    - Aurora Imager
    - Atmospheric composition instrument (UV-NIR)
    - Fourier Transform spectrometer (IR, similar to IASI)
  - Technology demonstration:
    - Software defined radio
    - V-band communications

Polar Comm. & Weather (PCW)/ PolarSat Mission, Canada (3)

Milestones

- Phase 0 completed: September 2008
- Phase A Approved: November 2008
- Phase A contract awarded: July 2009
- Phase A Major Milestones:
  - Phase A kicked-off: July 2009
  - Technology Readiness Assessment Review: September 2009
  - Critical Technologies Development procurement: November 2009
  - Mission Requirements Review: December 2009
  - Preliminary System Requirements Review: March 2010
  - Phase A contract close out: April 2010
- Critical Technologies development contracts award: April 2010
- Phase B/C/D approval: April 2010
- Phase B/C/D contract award: February 2011
- Launch of Satellite 1: August 2016
- Launch of Satellite 2: November 2016
- Beginning of operations: January 2017

Arctica Satellite System, Russia (1)

Mission Objectives

- Monitoring of the Earth atmosphere and surface in the Arctic (inaccessible for observation from geostationary orbit) on the basis of multispectral imaging with high temporal resolution (15 – 30 min).
- Providing heliogeophysical information in polar areas.
- Maintaining data collection system, telecommunication service for data exchange and retransmission.
- Search & Rescue service (COSPAS-SARSAT).

Arctica Satellite System, Russia (2)
Payloads

1) Multichannel Scanner MSU-GSM

Coverage: whole visible Earth disk (20x20 deg.);
Number of spectral channels: 10 (2 VIS, 8 IR);
Horizontal Resolution – VIS: 1 km, IR: 4 km;
Time Resolution: 5…30 minutes.

2) Heliogeophysical Measurement Complex GGAK-E

The GGAK-E set includes 7 sensors:

SKIF-6 – spectrometer of the corpuscular emission with particle energy in the following ranges 0,05…20,0 keV; 0,03…1,5 MeV; 0,5…30,0 MeV;

SKL-E – spectrometer of the solar cosmic rays with particle energy in the following ranges 1…12 MeV, 30,0… 300,0 MeV, > 350,0 MeV;

GALS-E – detector of the galaxy cosmic rays with particles energy in the range > 600 MeV;

ISP-2M – measurements of the solar constant in the range 0,2-100 microns;

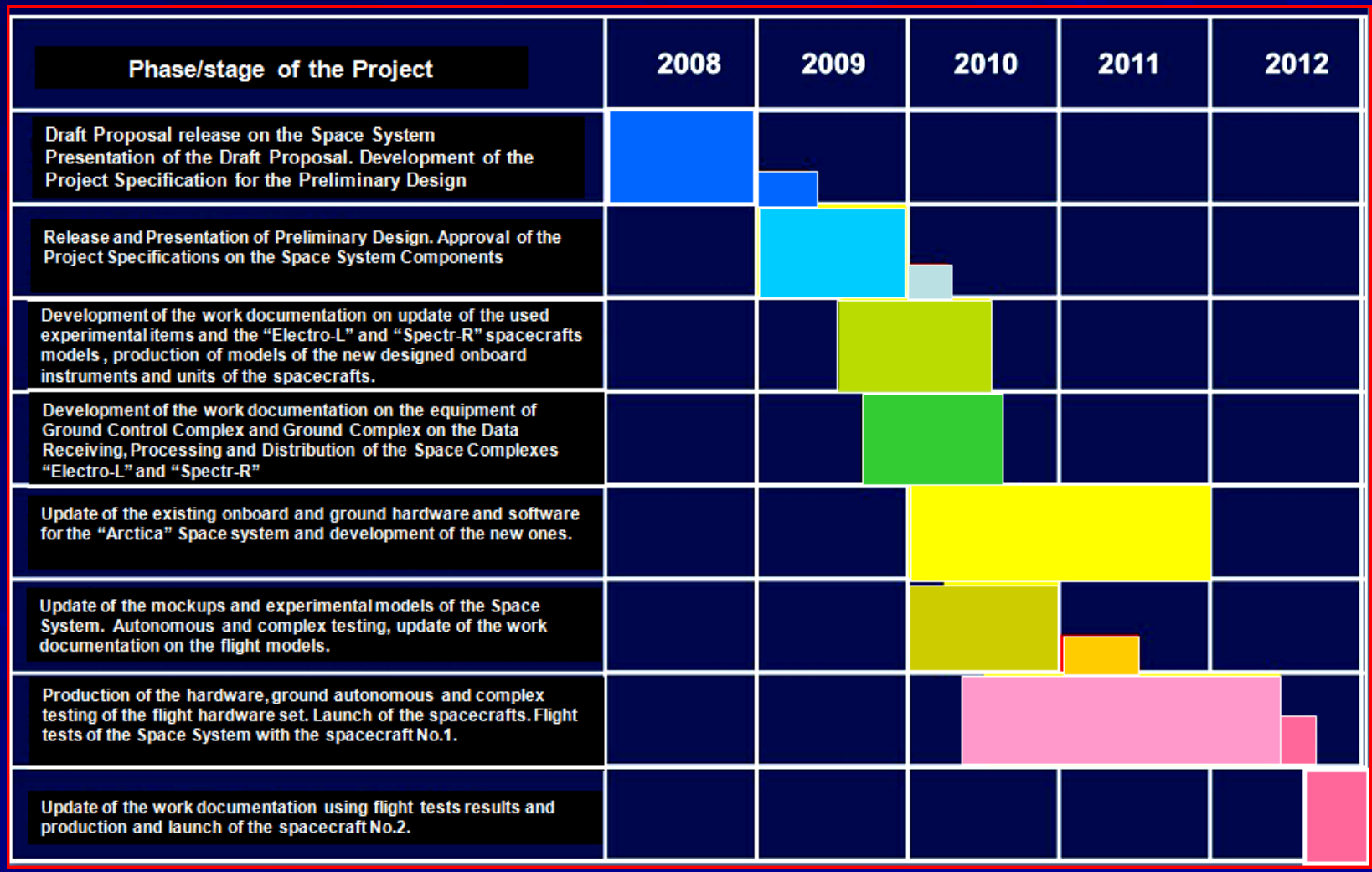
DIR-E - measurements of the solar X-rays with energy in the range 3-10 keV;

VUSS-E - measurements of the solar UV radiation at the Hydrogen resonant line HLa (121,6 nm);

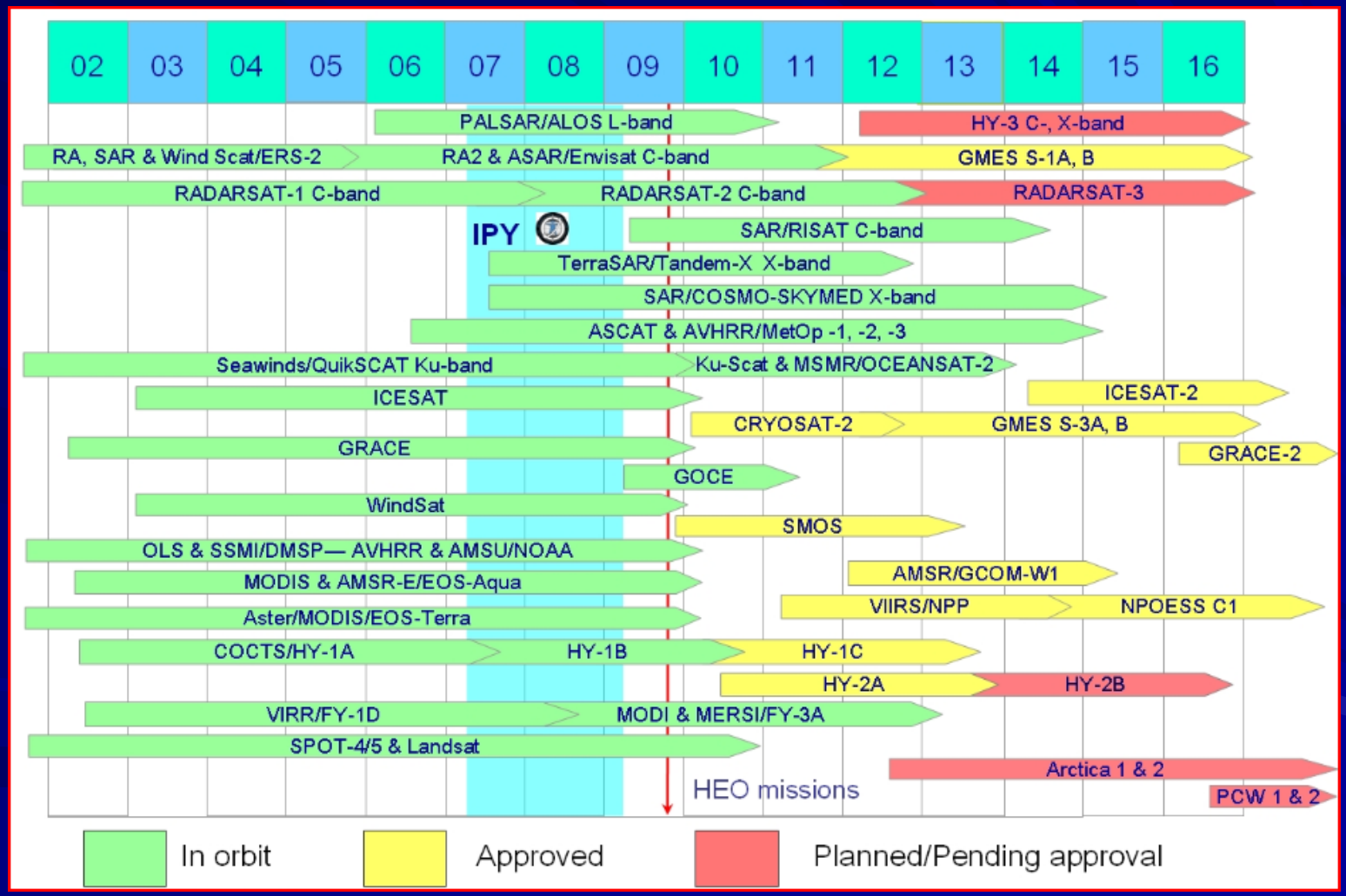
FM-E – magnetometer for the magnetic field intensity measurement in the range ±300 nanotesla.

Arctica Satellite System, Russia (3)

Milestones



Future Polar Satellite System



Courtesy M. Drinkwater