GIIPSY SAR REQUIREMENTS

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GIIPSY Activities since STG-3

- Organization and Presentation at SCAR ‘08 – St Petersburg
- Publication in Environmental Geology
- Abstract submitted to AGU; considering another Town Hall type meeting

SAR Acquisition Thematic Objectives

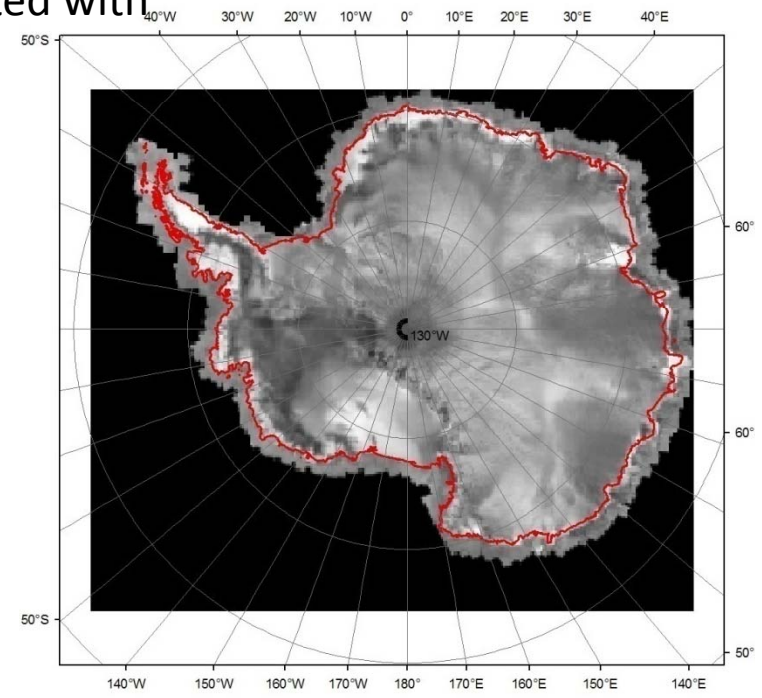
- C-Band coverage (3-day snapshots) for the Arctic Ocean during the remainder of IPY (background missions, operation data acquisitions, etc.).
- Winter Pole to Coast InSAR coverage of the Antarctic in high-resolution mode (3-4 consecutive cycles in ascending and descending).
- Greenland and Major Canadian Icefields of InSAR acquisition over 3-4 consecutive cycles of high-resolution in winter.
- Supersites (where possible using what exists already): determine acquisition parameters (frequency, resolution, etc.) for multi-polarization and polarimetry data collection.

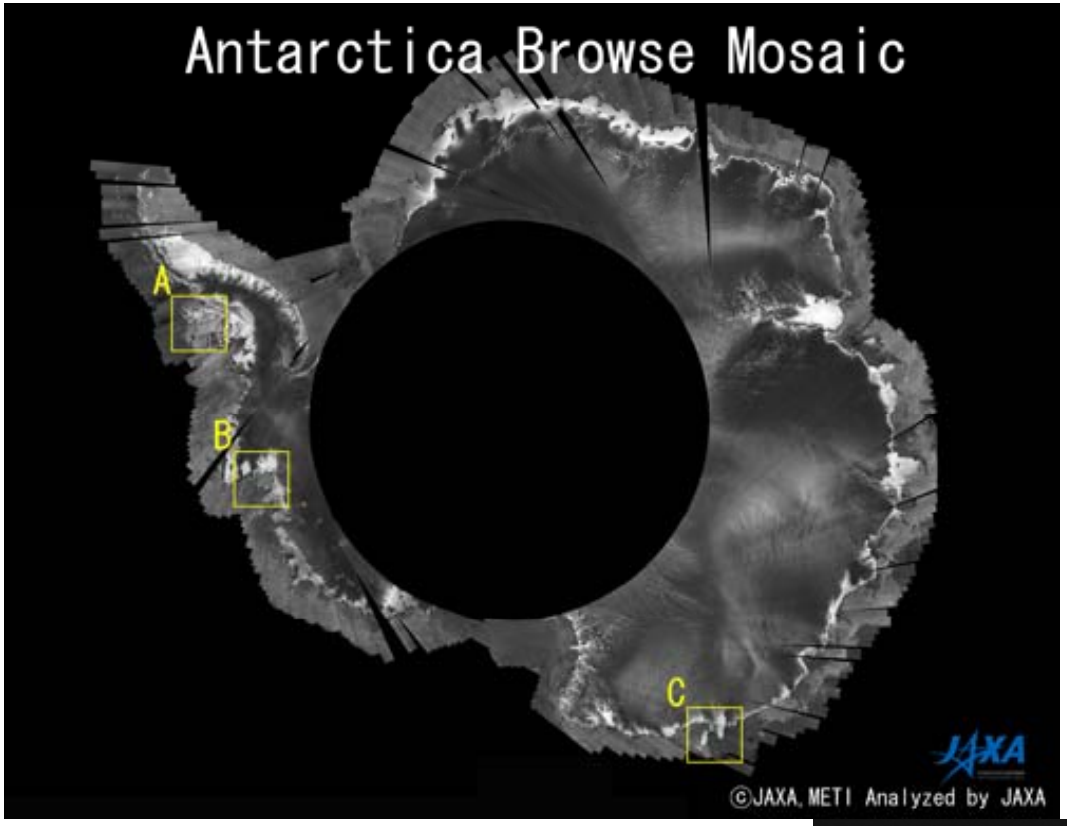
SAR Requirements for Antarctica

- **Thematic Objective: Sea level rise, and hemispheric climate:**
  1) *For the first time*, one summer, one winter SAR snapshot of the polar ice sheet. Near simultaneous imagery at **L, C,** and X band, polarimetric quad pole for documenting ice surface physical parameters.
  2) *For the first time*, pole-to-coast multi-frequency InSAR measurements of ice surface velocity **(75%).**
  3) *For the first time*, repeated X-band InSAR topography for detecting local changes in ice sheet elevation associated with motion of subglacial water.

Coverage Requirement

1) From pole to 150 km seaward of RAMP coastline (right image)
2) 4 successive cycles of observations
3) Ascending and descending coverage
4) Observations during the period of April to November (can be relaxed for regions south of 80 degrees Latitude)



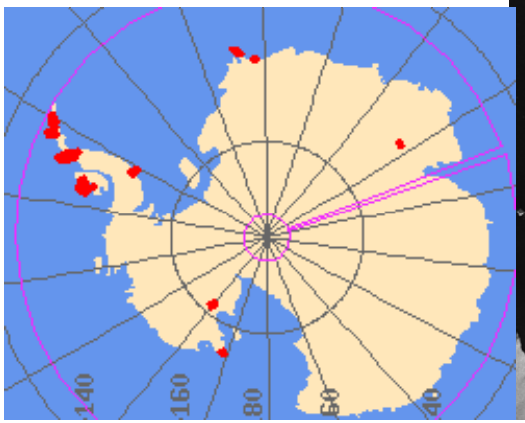


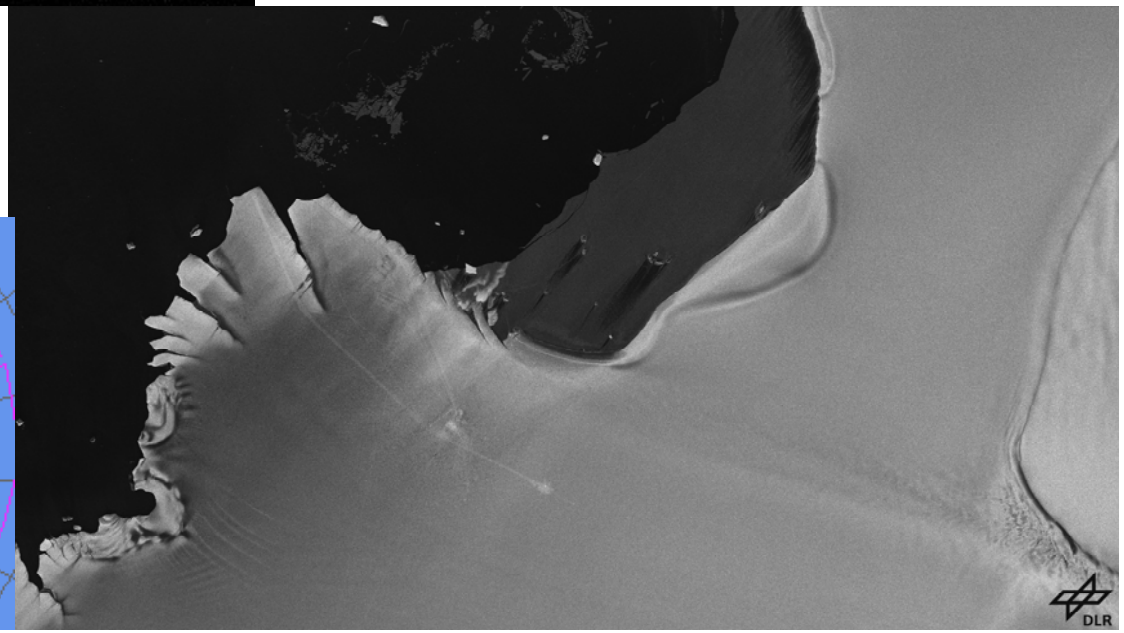
(1) Multi-frequency Snapshots of Antarctica

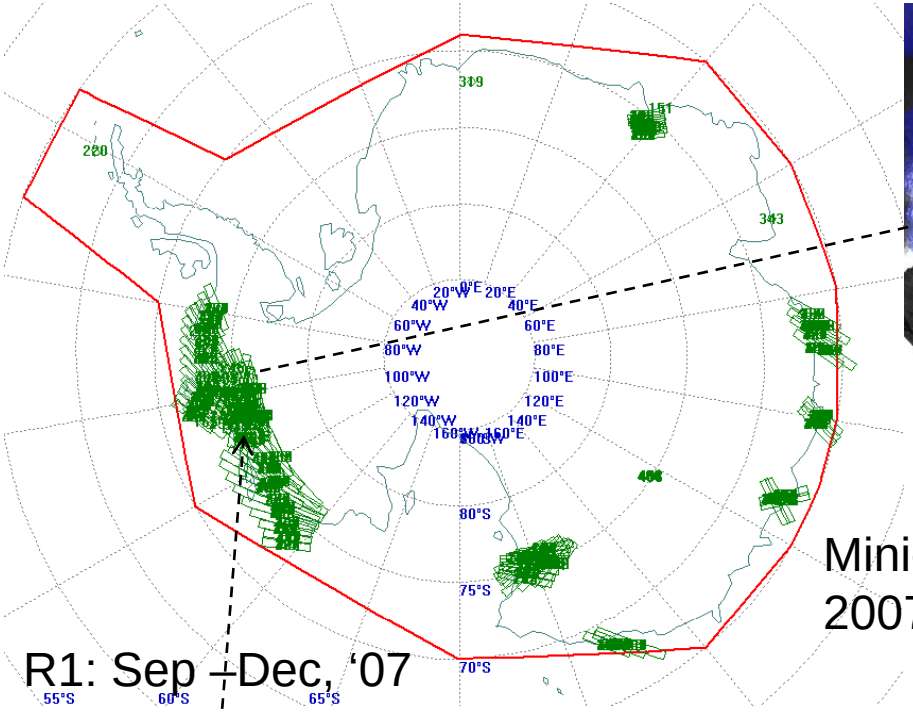
TerraSAR-X: 10 February 2008;
Antarctic station Neumayer II

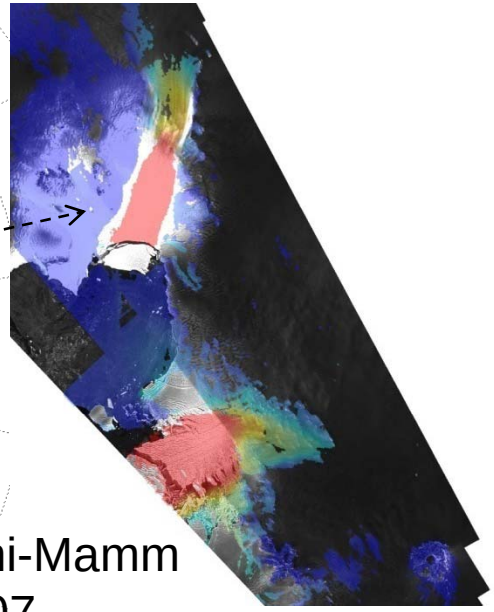
PALSAR Mosaic:
Dec. 2007 – Jan. 2008

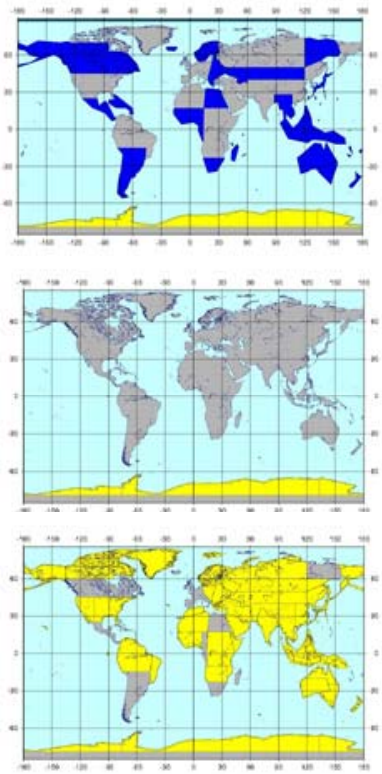
TerraSAR-X

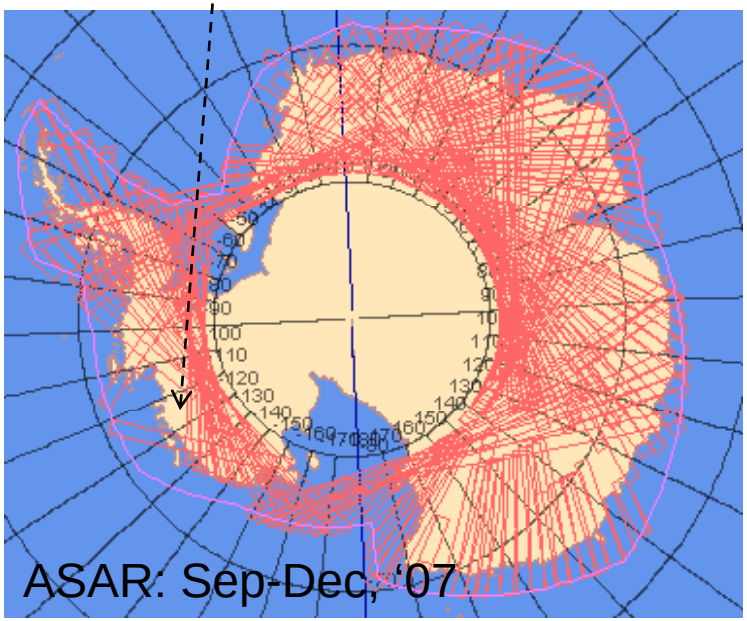




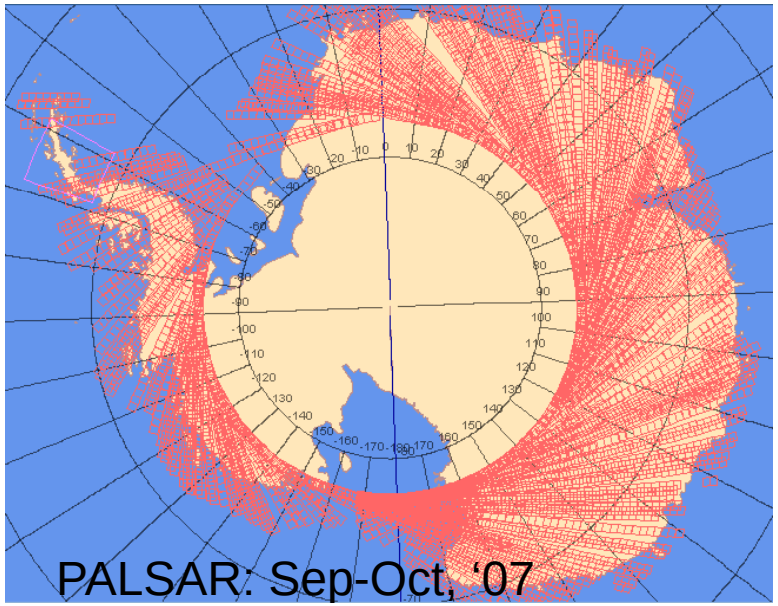








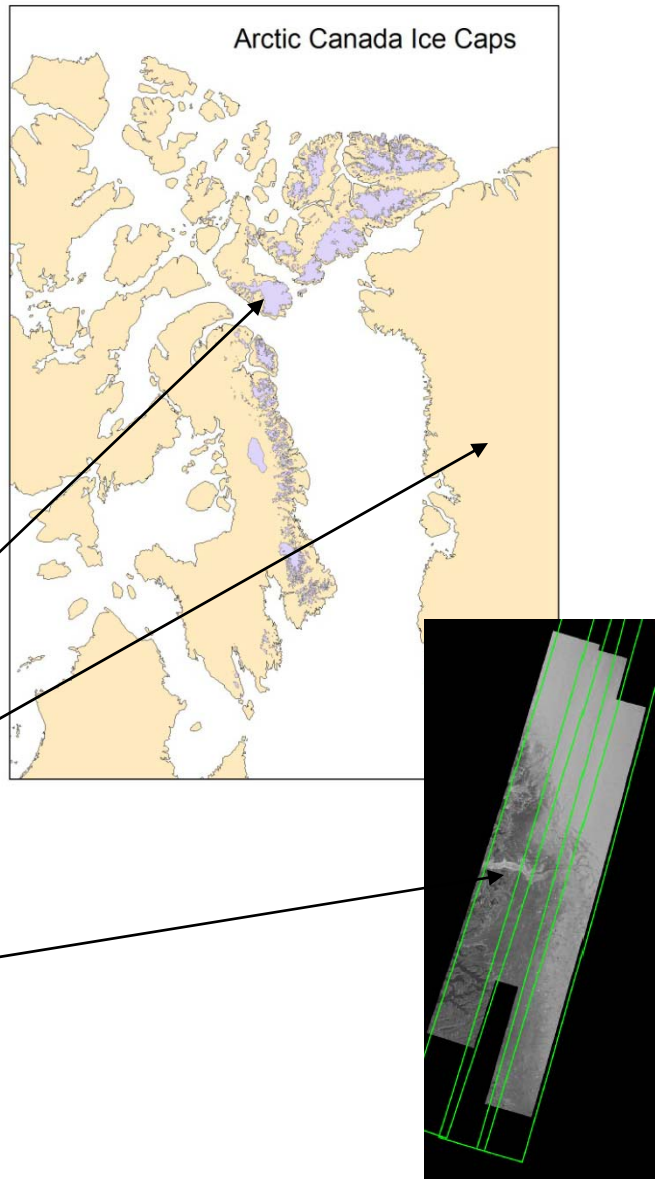
(2) InSAR Coverage



SAR Requirements for Arctic Land Ice

Thematic Objective: Sea level rise, and hemispheric climate:

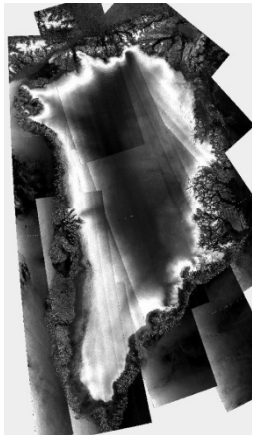
1) One summer, one winter SAR snapshot of the Arctic Ice Caps. Near simultaneous imagery at **L, C,** and X band, polarimetric quad pole for documenting ice surface physical parameters.
2) One, winter, multi-frequency InSAR measurement of ice surface velocity ***(75%)***
3) Repeated InSAR observations of the most rapidly changing outlet glaciers **(Jacobshavn)**



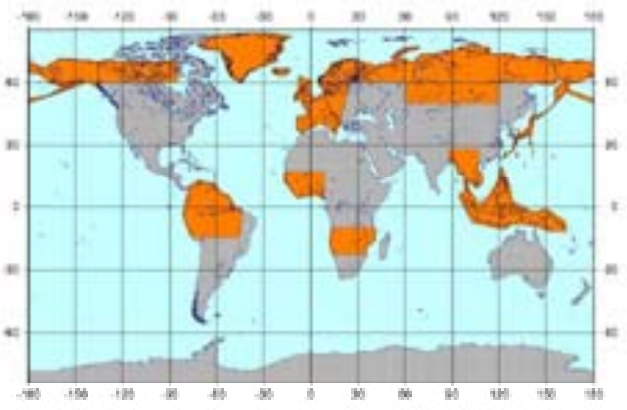
Coverage Requirement

1) Canadian Ice Caps InSAR: 4 consecutive cycles in Dec 2008-March 2009 (see map at right)
2) Greenland Ice Sheet InSAR: 4 consecutive cycles covering the entire ice sheet in Dec 2008-March 2009
3) Jakobshavn Glacier: every cycle for 3 adjacent tracks

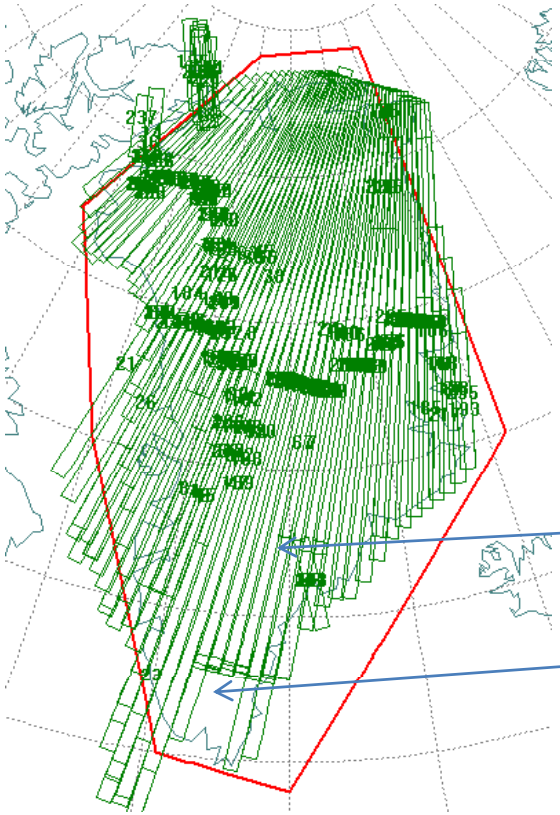
(1)(2). Snapshots and InSAR Coverage



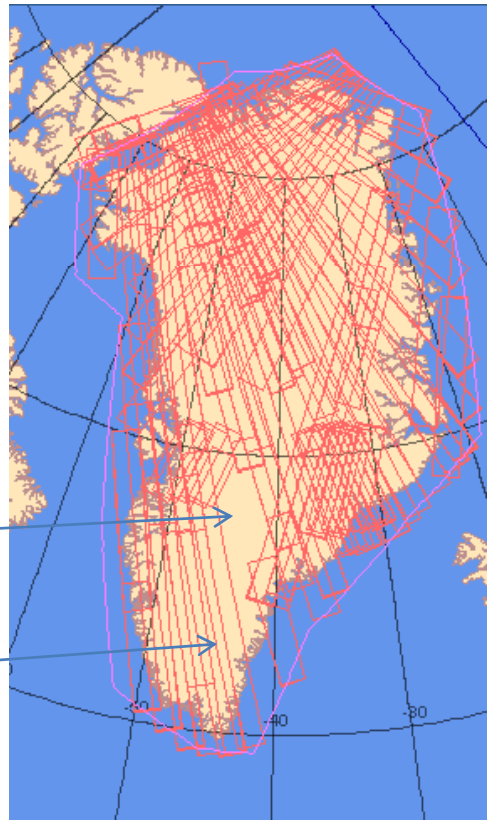
ASAR WS Sep 08



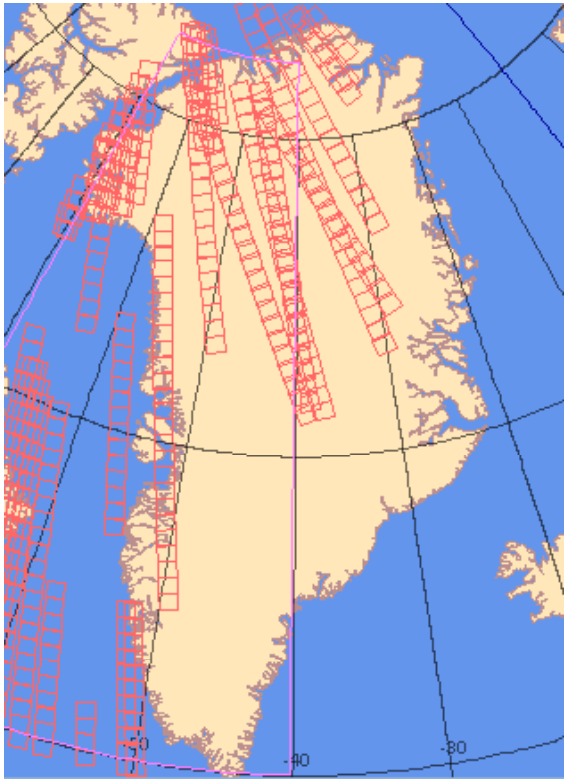
R1
Nov 07 - Mar 08



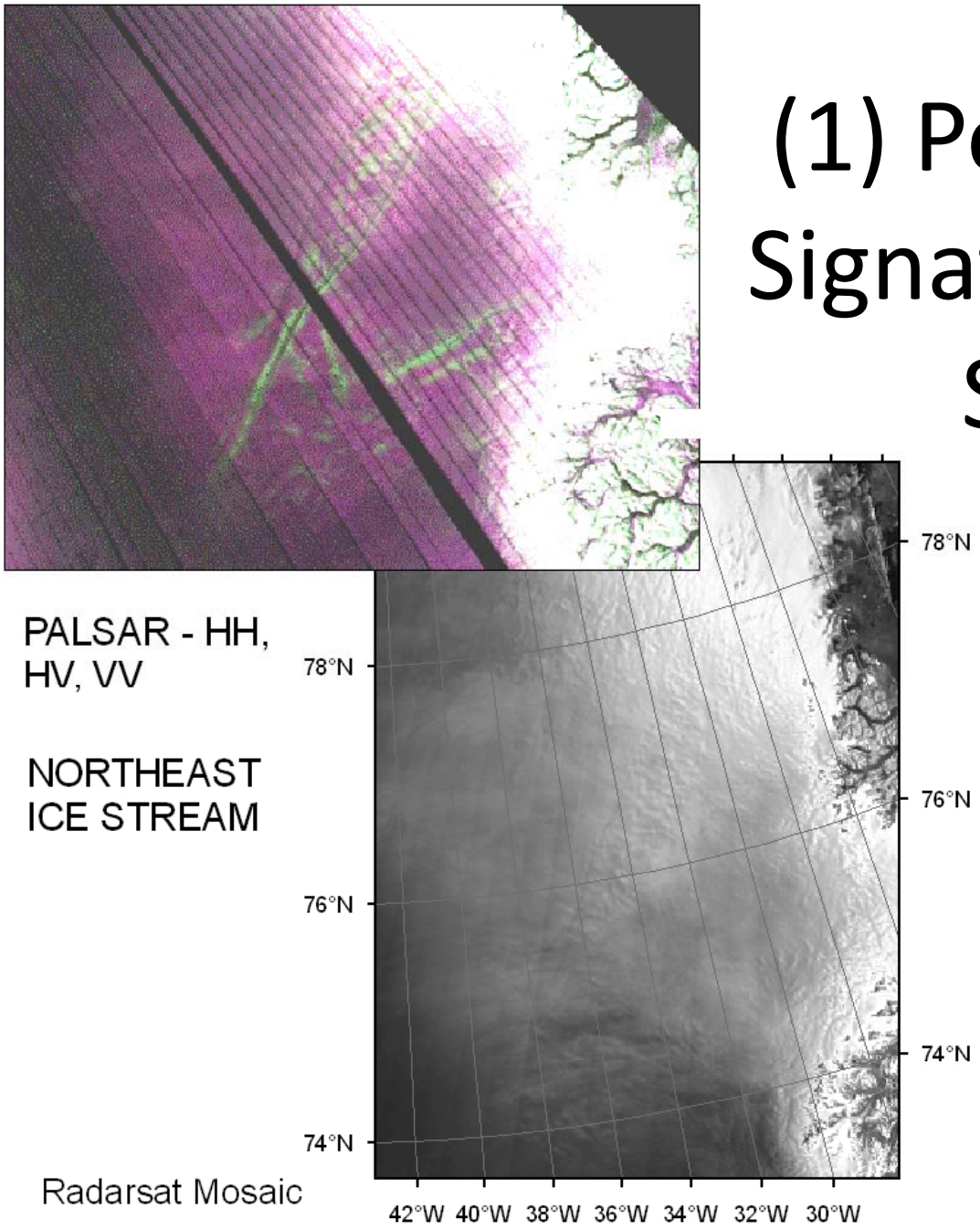
ASAR:
Oct 07 – Mar 08



Palsar
Cycle 10-11 Mar-Apr-07

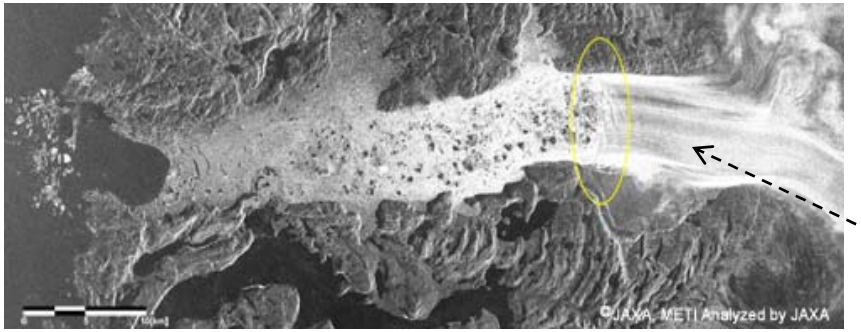


(1) Polarimetric Signatures of Ice Sheets

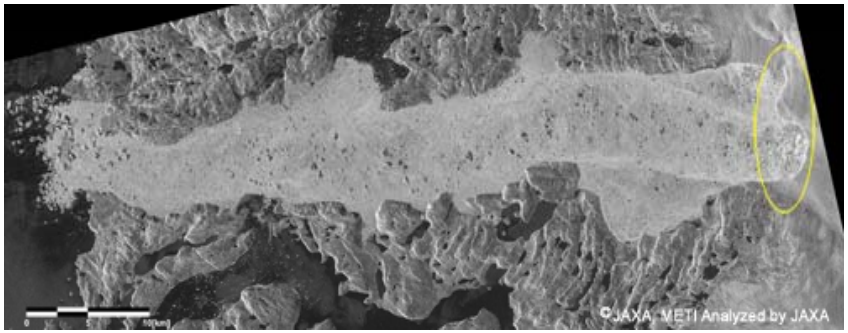


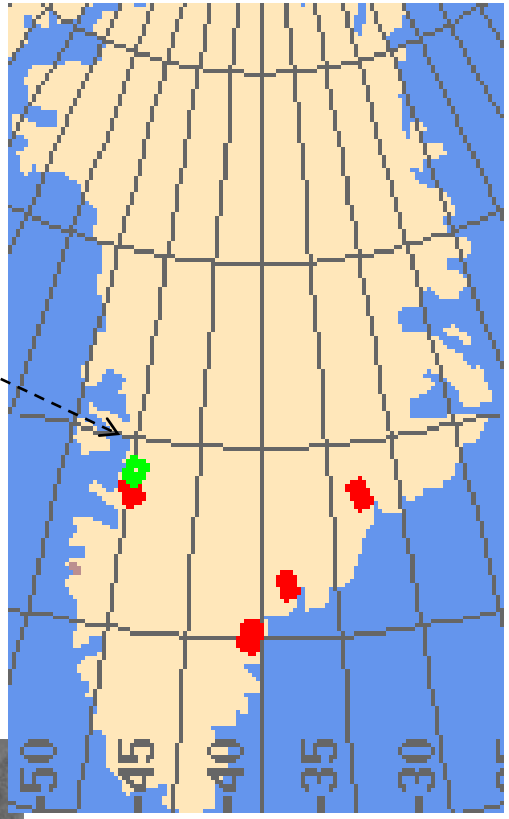
HV indicative of volume scattering along the margins of the NE ice stream.

JERS-1
Oct. 4, 1994



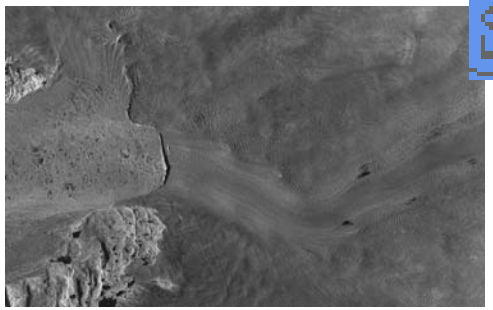
PALSAR
Aug. 3, 2007



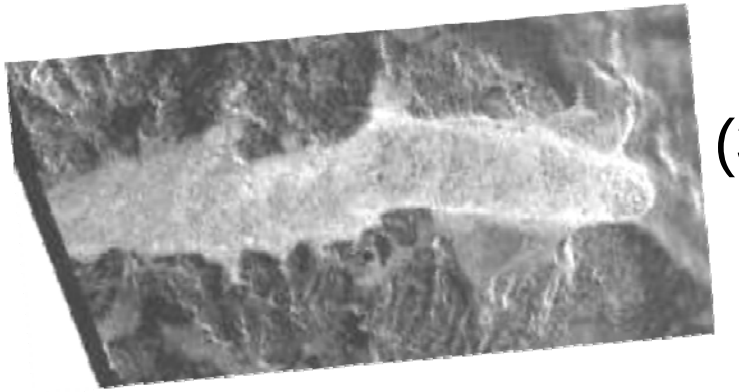


TerraSAR Sites

TerraSAR
June, '08



ASAR Browse
Sep. 18, 2008



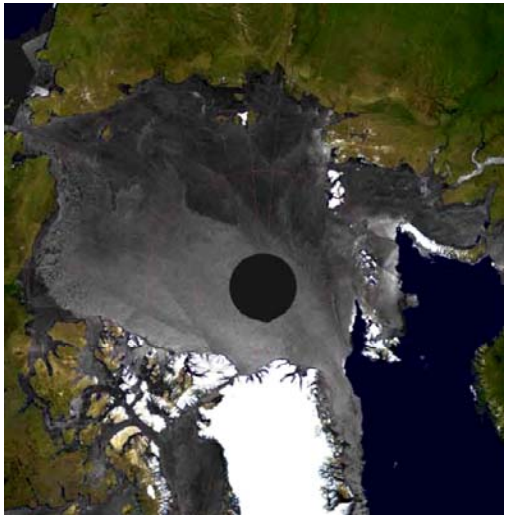
(3) Fast Glacier Mapping

SAR Requirements for Sea Ice (Arctic and Southern Oceans)

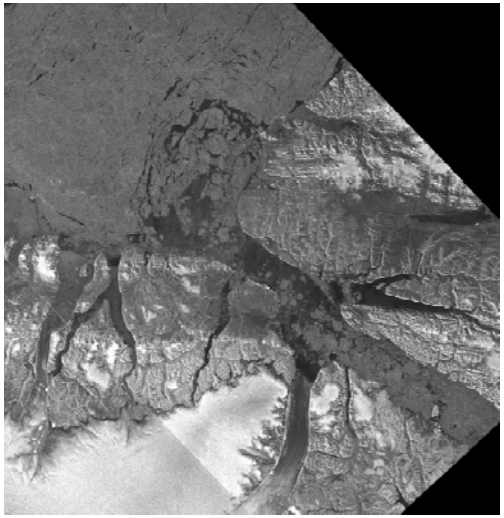
• Thematic Objective

Ocean circulation and polar air-sea interactions (Sea ice):

1) ***For the first time***, L-band SAR mapping of the Arctic ocean and marginal seas sea ice cover for leads and ridges.
2) *For the first time*, repeat fine resolution SAR mapping of the entire Southern ocean sea ice cover for ice motion.
3) *For the first time*, SAR and optical fine resolution mappings of the entire Arctic ocean.
4) Systematic 3-day medium resolution SAR mapping of sea ice covered waters for motion, and melt pond coverage.



Envisat Arctic SAR Mosaic

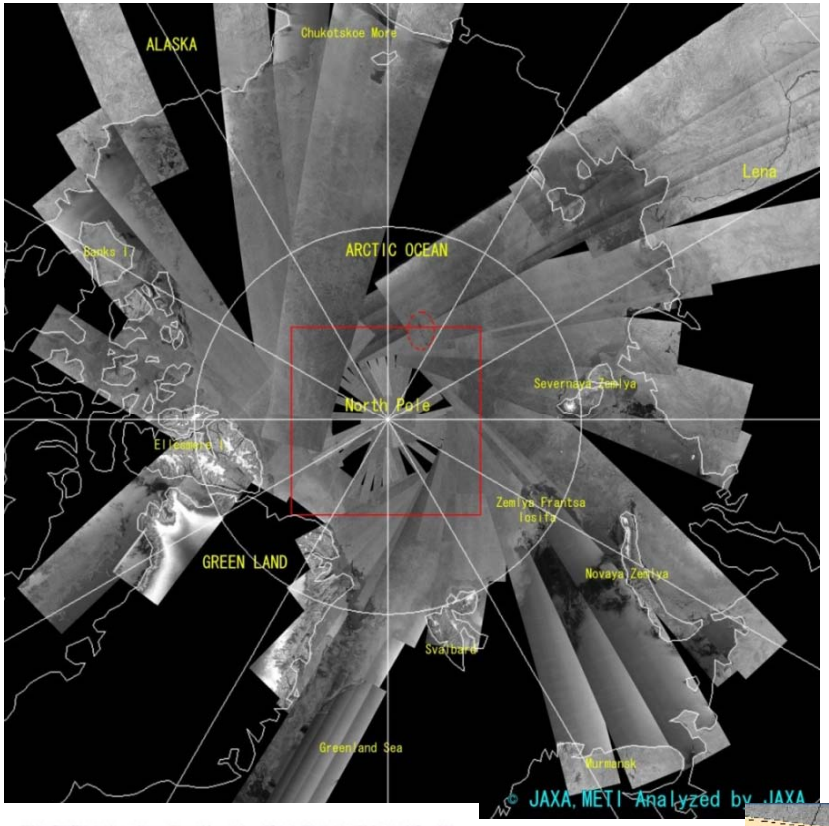


Nares Strait

Coverage Requirement

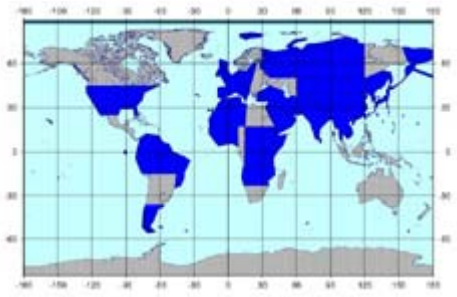
1) Coverage of ice-covered waters with the ice edge of the Arctic and Southern Oceans
2) 3-day systematic mapping of the Arctic Ocean
3) Ascending and descending coverage
4) Year round coverage defined by the time-varying ice edge

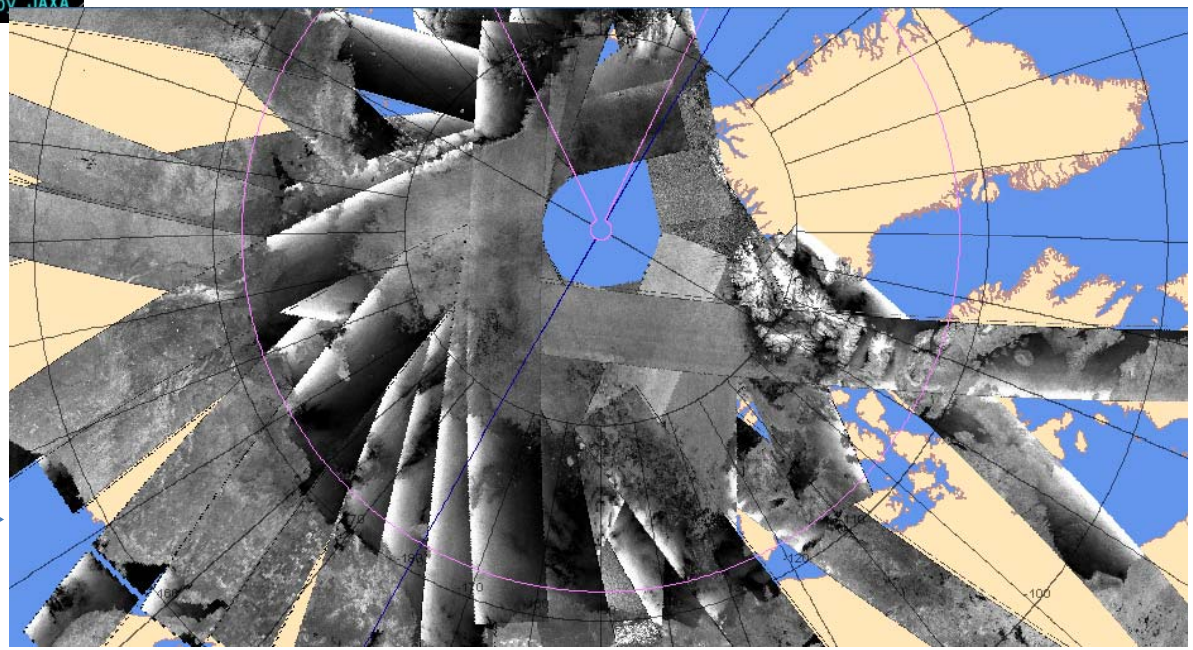
Arctic Sea Ice and Land



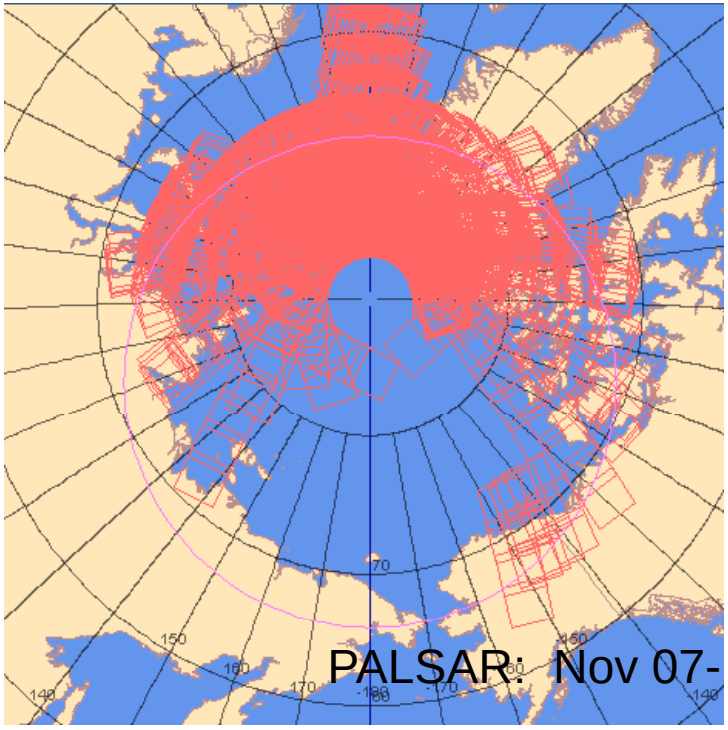
(1) L-band Coverage: PALSAR: June – July '08
Note these are acquisitions added to the published plan

Only selected swaths mosaicked.
There is extensive coverage over Arctic lakes, rivers and permafrost



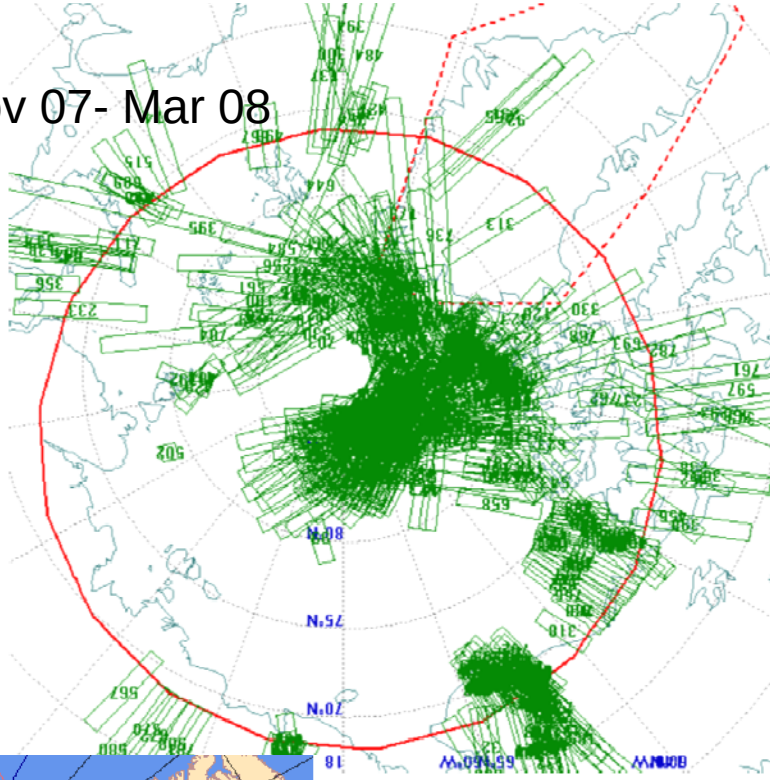


ASAR GM: Sep 13-20, '08

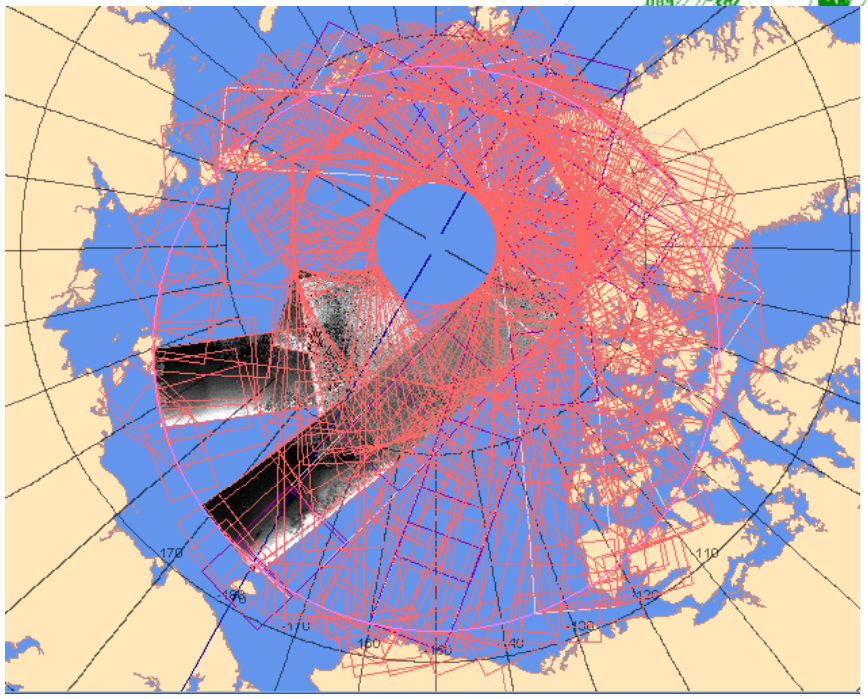


PALSAR: Nov 07- Mar 08

R1: Standard; Nov 07- Mar 08



(4) Systematic Arctic Sea Ice



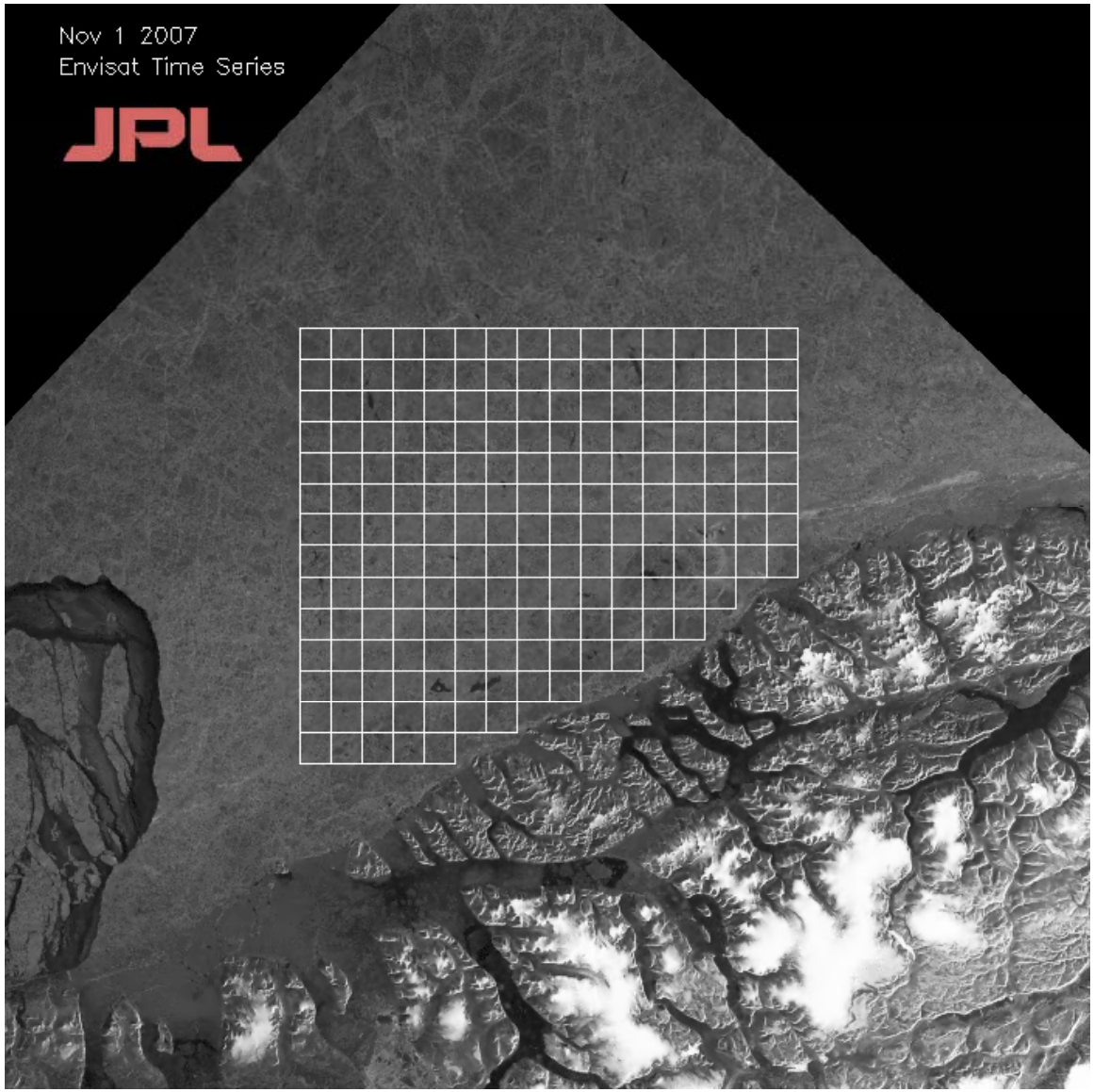
ASAR WS:
SEP 1-20, ‘08

GIIPSY SAR Supersite locations and requirements

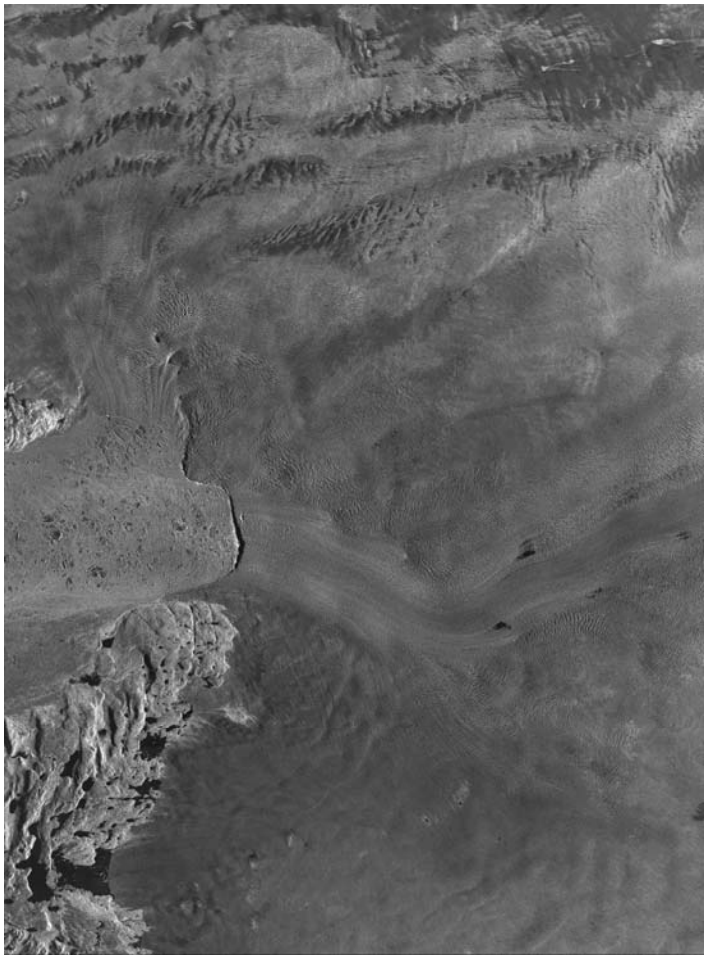
Supersite Name	Cryosphere Theme	Type of Activity	Coordinate Information	Time	POC
ARCTIC					
Fram Strait, Lincoln Sea and Nares Strait	Sea Ice	Shipborne measurements	Lincoln Sea: 60 E between 84 and 77 deg North Latitude through the Nares Straits. Fram Strait: 80 deg North between 0 and 20 deg W	Summer '08	P. Gudmandsen, R. Kwok
Devon Island	Ice Cap	in situ, airborne and spacborne measurements	47 km long traverse connecting: UTM zone 17 - NAD83 Geodetic - WGS84 ID EASTING NORTHING Longitude Latitude Site 1 452646.8 8362202.5 -82.67640000 75.33990000 Site 2 449317.8 8344328.9 -82.77522119 75.17892027 Site 3 445868.6 8326144.7 -82.87580894 75.01507403 Site 4 444109.6 8317471.1 -82.92695956 74.93687241	Summer '08	Martin Sharp
Amundsen Gulf and Franklin Bay	Sea Ice	multidisciplinary shipborne campaign	Amundsen Gulf: 70°56'05.57"N 122°18'18.67"W Franklin Bay: 69°58'07.38"N 126°03'36.97"W		D. Barber
Jacobshavn Glacier	Ice Sheet	In Situ, Airborne and Spaceborne measurements	Between 68 and 70 North, 50 and 42 W	June15 through July 15 '08	P. Gogineni
ANTARCTIC					
Pine Island Glacier	Ice Sheet	Site of several early measurement campaigns	Pine Island: 102 W to 95 W; 74 S to 76 S	Sept 08-Oct 08	Community wide interest; several field programs
Thwaites Glacier	Ice Sheet	Airborne and in situ measurements	Corner Coor: 74.8S, 120W 74.8S 135W 79.9S 138.8W 79.9S 116.2W	Dec 08-Jan 09	P.Gogineni

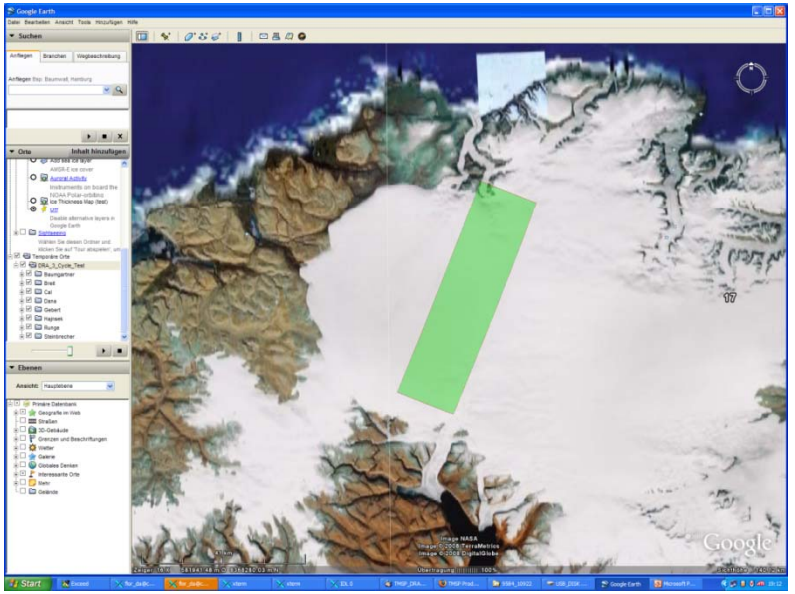
Lincoln Sea ASAR

- Winter 2007 deformation field



TerraSAR June ‘08

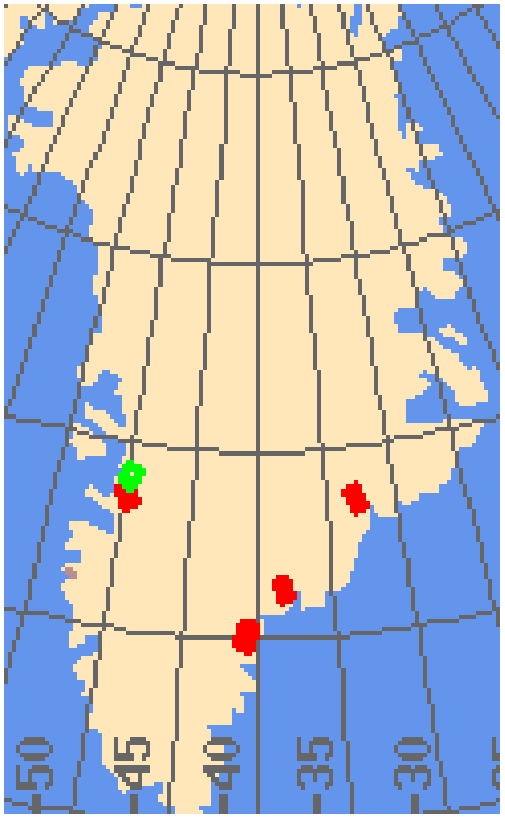




Super Sites

Jakobshavn

Devon Island



TerraSAR Acquisitions

Conclusions

- Substantial progress on multi-frequency, polarimetric SAR mapping of Arctic and Antarctic land, ocean and ice.
- Substantial progress on InSAR mapping of Arctic and northerly areas of Antarctic.
- Repeat imaging of Western Arctic with R1 remains an issue
- Plan for Antarctic pole-hole InSAR mapping needed
- Supersite imaging is beginning. Coordination plan needed
- Need to better integrate COSMOS-SKYMED into the planning
- Provide lessons learned to upcoming missions (DESDyni, Sentinel, Tandem-X?)

Some Suggestions

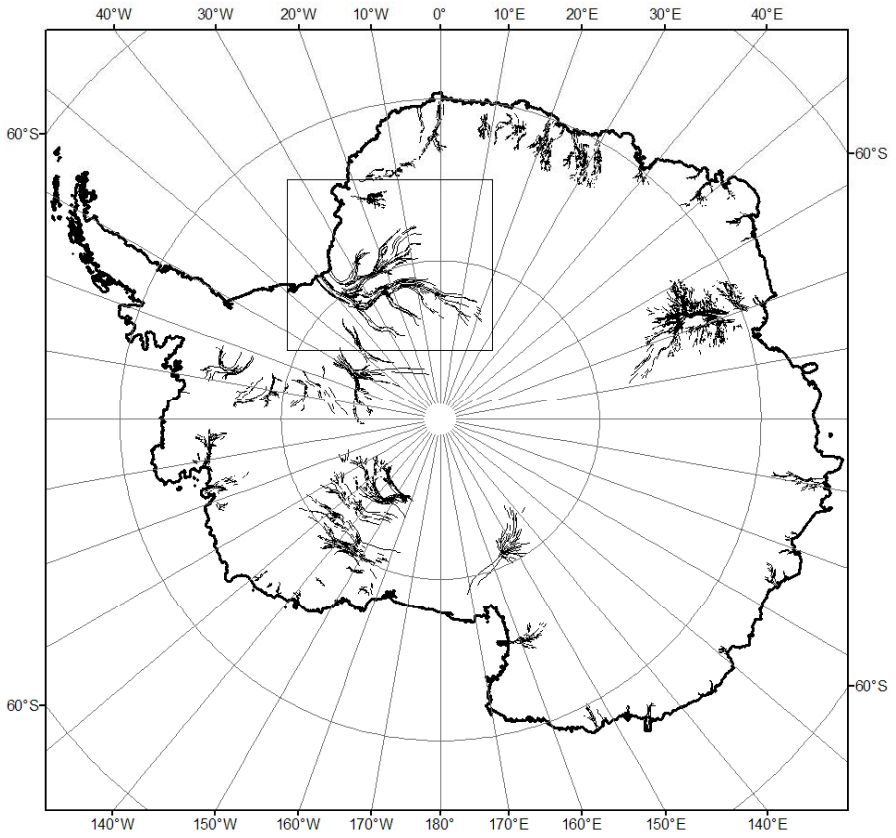
- Open access to metadata about acquired data on TSX EOWEB and PALSAR Node Sites (JAXA/ASF)
- ALOS frame based granules in EOLISA result in large numbers of hits. Add strip granules?
- Provide Radarsat and PALSAR browse swath image displays and InSAR sorting (e.g. Eolisa)
- Maintain R1 SPA Archive and Create R2 Archive for FTP
- Agree to a common format (or format translator) for metadata so that integrated maps of IPY data collections can be compiled and compared.

Detailed Requirements

SAR Requirements for Antarctica

Sensor Requirements

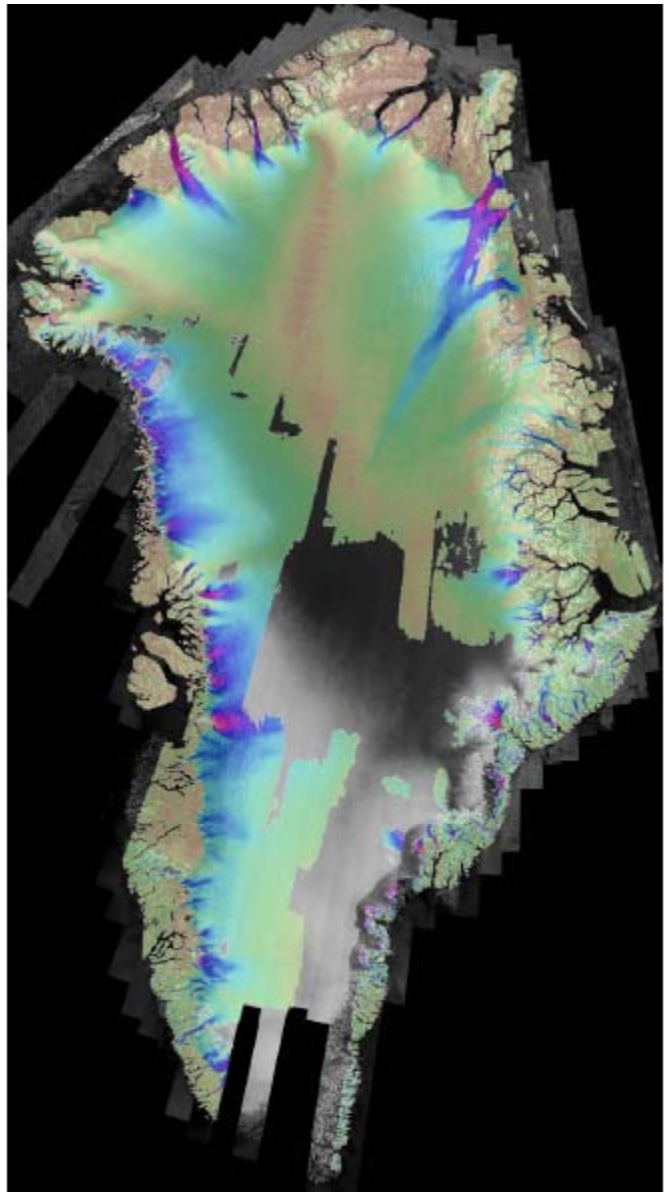
1. Fine beam and standard beam coverage to southerly limit of right looking satellites
2. Fine beam and standard beam coverage between about 78 South to pole for left looking satellites
3. Observations with highest bandwidth and shortest repeat over fast glaciers (right image) and Antarctic Peninsula.
4. Desirable to have overlap between left and right looking coverage areas (extended beams)



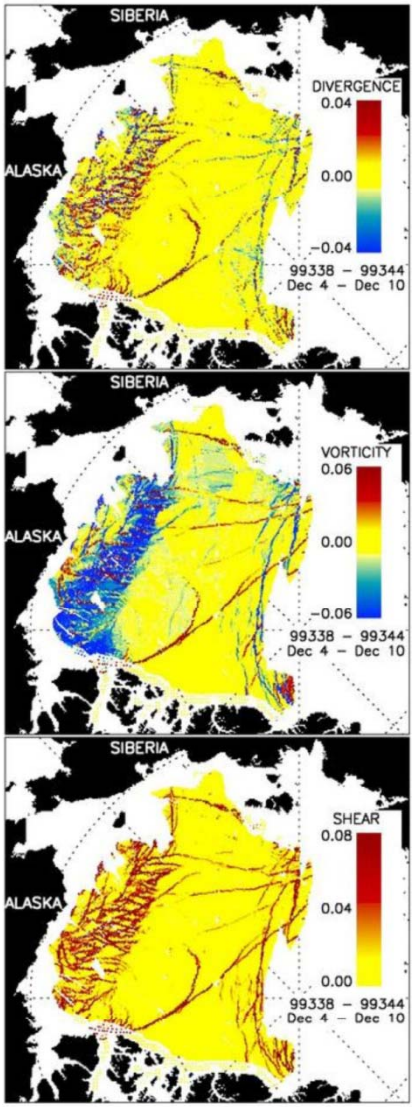
SAR Requirements for Arctic Land Ice

Sensor Requirements

1. InSAR observations: select highest bandwidth radar modes and shortest repeat cycles over fast glaciers (right image). 200 m baseline.
2. One summer and one winter, L, C and X band near simultaneous image mapping with comparable beam modes (25 m, 23^{o}).



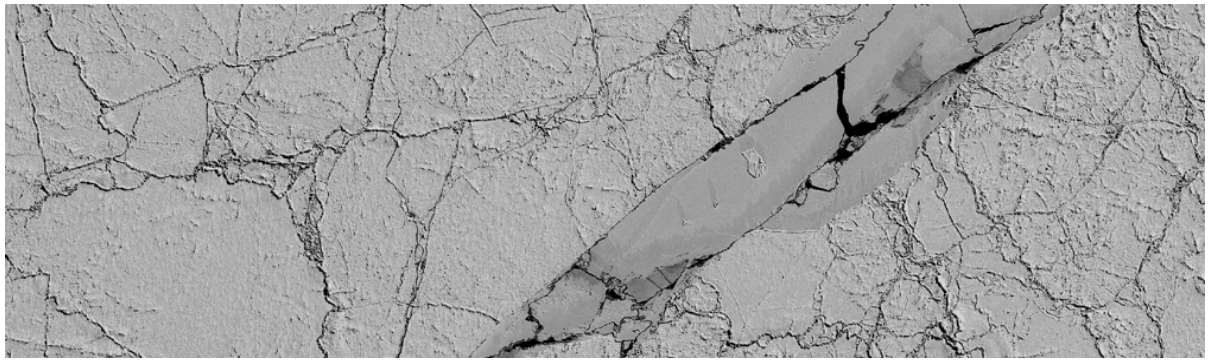
SAR Requirements for Sea Ice (Arctic and Southern Oceans)



RGPS ice deformation

Sensor Requirements

- **C-band**
  - Wide-swath C-band ScanSAR for systematic 3-day mapping of ice-covered oceans.
  - Short time-separation (daily) repeat coverage of the Lincoln Sea, Nares Strait and Fram Strait at C-band.
- **L-Band**
  - L-band quad-pol SAR coverage of the Arctic and Southern Ocean sea ice.
  - L-band ScanSAR coverage of the sea ice cover.
- **Optical coverage**
  - Optical coverage of the Arctic and Southern Oceans sea ice.



Optical coverage