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Space Task Group of the IPY Sub-Committee on Observations

SAR Workshop Summary

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STG Steering Committee

Canada

- **STG2 – A9 - Action on CSA** - to set up an inter-agency meeting of SAR mission managers to optimise SAR coverage - in order to address top level scientific objectives/requirements stated in the GIIPSY User requirements document.

Meeting Objective

- Develop an acquisition strategy for SAR and InSAR data that achieves the maximum number of IPY science objectives in such a way as to distribute the acquisition load across the different agencies

Approach

- To review existing GIIPSY science requirements (the Global Inter-agency IPY Polar Snapshot Year (GIIPSY) Strategy Document)
- To present the Agencies strategic priorities in line with IPY science activities.
- To present and review current acquisition plans focused on IPY.
- To present the satellite and ground segment operators system capabilities and constraints related to the acquisition of data in support to IPY.
- To forge a coordinated / multi-agency SAR acquisition plan in support to IPY (remainder and legacy).

Proposed Agenda

1. WELCOME	
9h30	Welcome address
9h35	Meeting Objectives
2. SETTING THE STAGE	
10h00	STG Framework and role of Space Agencies
10h15	Science Requirement Summary
11h00	Space Agencies session
13h00	Lunch
14h00	Mission and Ground Segment Operators capabilities
3. CROSS-CHECKING SCIENCE REQUIREMENTS WITH AGENCIES CAPABILITIES	
15h00	Introduction
	Open forum
	Summary
4. FORGING THE PLAN	
9h30	Presentation of a draft plan
10h00	Open Discussion on draft plan
11h00	Summary of the meeting and action items

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The STG SAR Coordination Meeting was unique opportunity for the science community of IPY to influence Space Agencies Mission management

Canada

Meeting Outcomes

- 13 organisations were represented at this meeting
  - 6 Space Agencies
  - 3 Ground Segment Operators
  - 4 end-user and research organsations
- Presentation material available on the GIIPSY website

Meeting Outcomes

- Agreement to focus the acquisition strategy on:
  - Solving important science problem
  - Filling a gap in planned coverage for IPY (build from existing agencies' imaging activities)
  - Involve interagency collaboration (no-single agency can do it all)

Meeting Outcomes

- Agreed themes:
  - 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-polarisation and polarimetry data collection.

Meeting Outcomes

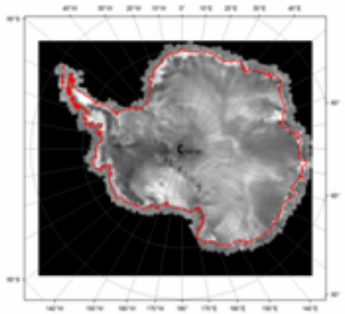
- In addition to the GIIPSY User Requirements Documents, focused SAR requirements documents were generated

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.
  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

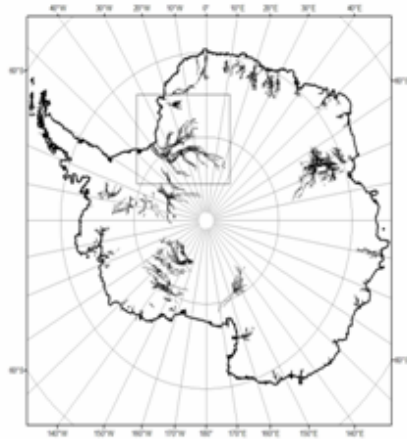
1) From pole to 150 km seaward of RAMP coastline (right image)
2) 4 successive cycles of observations
3) Ascending and descending coverage
4) Observations during the period of April to November (can be relaxed for regions south of 80 degrees Latitude)



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)



Meeting Outcomes

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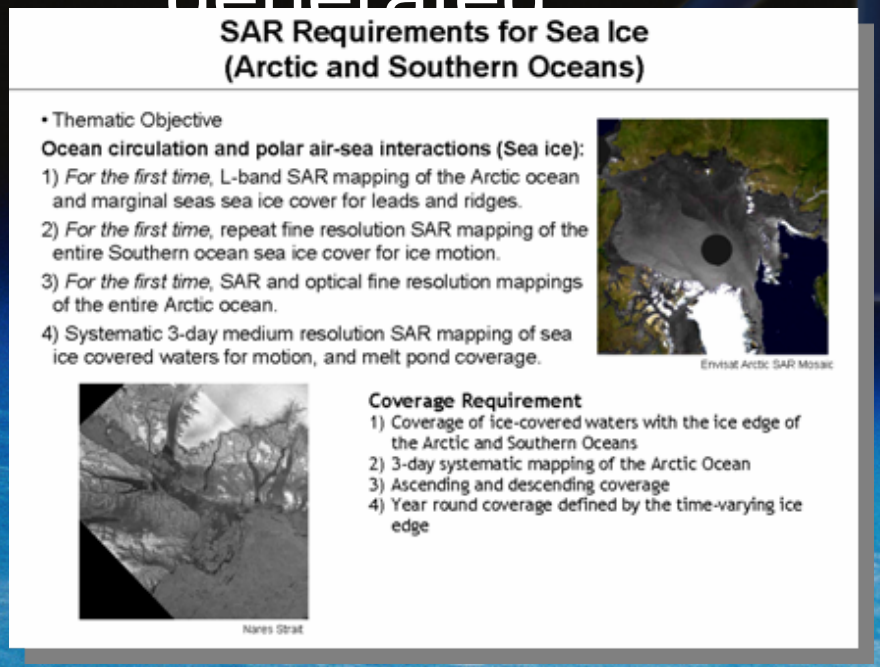


SAR Requirements for Sea Ice
(Arctic and Southern Oceans)

• Thematic Objective

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

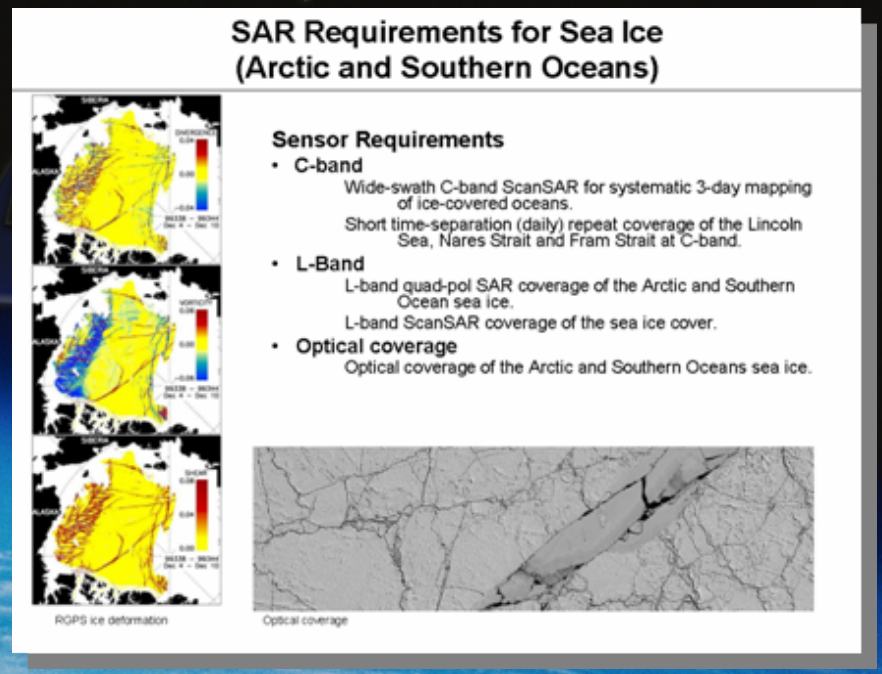
1) *For the first time*, L-band SAR mapping of the Arctic ocean and marginal seas sea ice cover for leads and ridges.
2) *For the first time*, repeat fine resolution SAR mapping of the entire Southern ocean sea ice cover for ice motion.
3) *For the first time*, SAR and optical fine resolution mappings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



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

Meeting Outcomes

- In addition to the GIIPSY User Requirements Documents, focused SAR requirements documents were generated

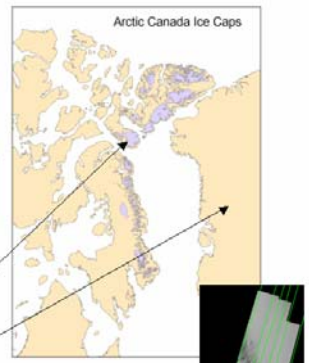
SAR Requirements for Arctic Land Ice

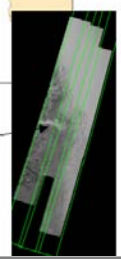
Thematic Objective: Sea level rise, and hemispheric climate:

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.
3) Repeated InSAR observations of the most rapidly changing outlet glaciers

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





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°).