



---

***Polar Space Task Group  
SAR Coordination Working Group Meeting 5  
Status DLR (TerraSAR-X / TanDEM-X)***

Dana Floricioiu, Achim Roth



# *Imaging Requirements for TerraSAR-X & TanDEM-X Missions*



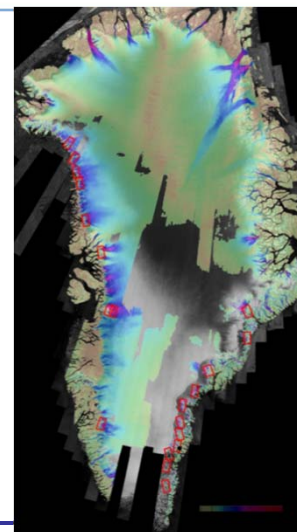
- **Ice Sheets:** TSX supports Greenland outlet glaciers, ESA climate change initiative (AIS\_cci); Global TanDEM-X DEM (90 m) will be made available
- **Floating Ice:** TSX NRT support for ships cruising in ice; TSX classifications over river and lake ice (10 cold spots)
- **Permafrost:** cold spots monitoring with TSX for permafrost modeling; coastal erosion with InSAR (limited areas);

# *TerraSAR-X Greenland outlet glaciers 2015/2016*

## **Objective**

Ice velocity measurements of Greenland outlet glaciers. Monitoring rapidly changing outlet glaciers.

TSX acquisitions started in 2009



## **Approach**

- Science proposal, PI Ian Joughin.
  - Stripmap mode (30 km swath width)
  - 27 sites are monitored about 14 times /year.
  - Additional 26 sites monitored about 10 times/year
  - Total: ~730 TSX L1b products  
1.10.2015 – 9.09.2016

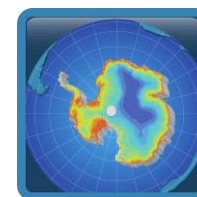
## **Metric estimates**

1 L1b product ~1.5 GB  
~1TB since PSTG SAR CWG 2015  
(1.10.2015 – 9.09.2016)



Polar  
Space  
Task  
Group

# ESA Climate Change Initiative Antarctic Ice Sheet



Aim: longterm and reliable production of a set of key parameters, e.g.

- **Grounding Line Location (GLL)**

over key areas in Antarctica

<http://www.esa-icesheets-antarctica-cci.org/>

Method: DInSAR

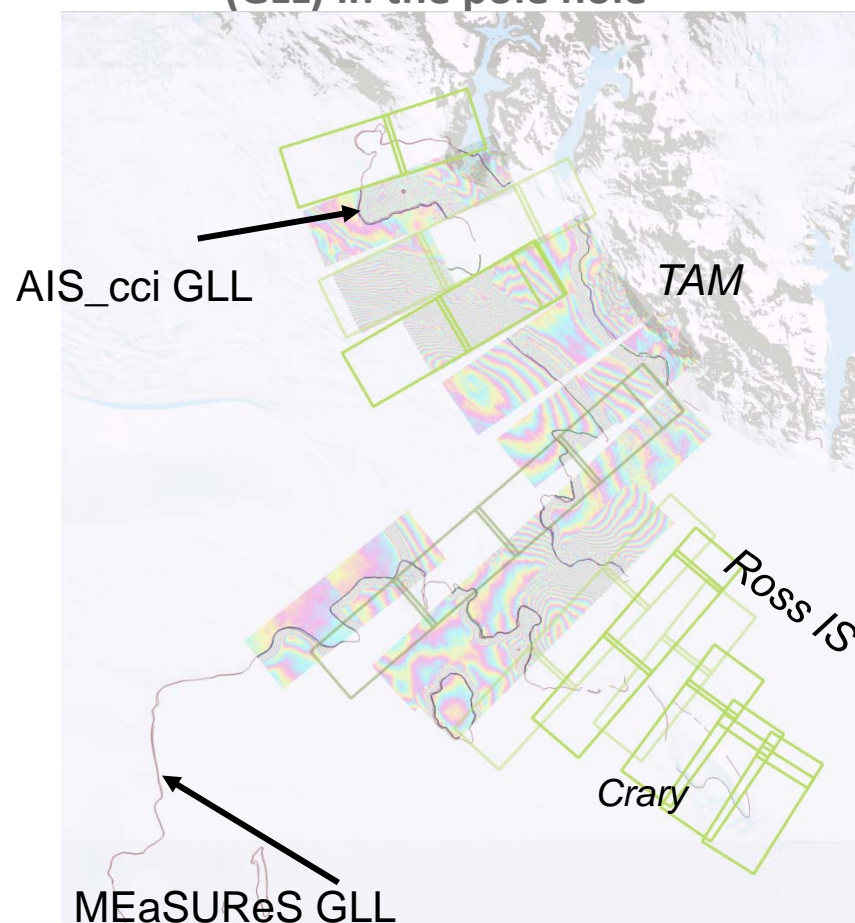
Data: ERS1/2 Tandem, TSX, Sentinel-1

1st operational AIS\_cci products available at:

<http://cryoportal.enveo.at/antarctica.html#tab2>



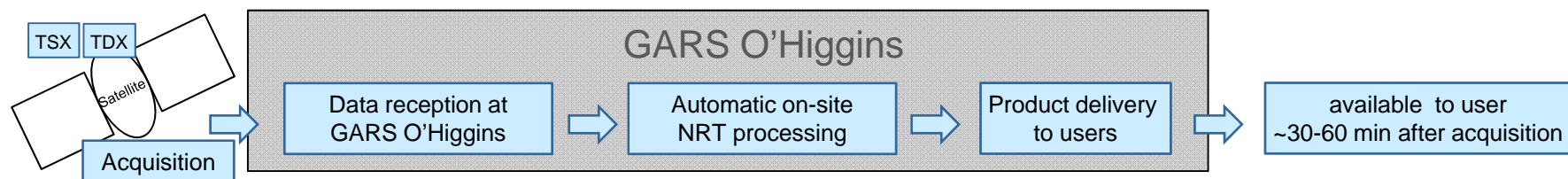
## TerraSAR-X for Grounding Line Location (GLL) in the pole hole



## Near-real time acquisition, reception and processing of TerraSAR-X data at GARS O'Higgins

Support of research vessels in the Antarctic with NRT radar information: an innovative service at DLR's Antarctic station GARS O'Higgins

In cooperation with the TerraSAR-X Payload Ground Segment and the Maritime Safety Research Departments at DLR Neustrelitz / Bremen



- NRT-Service on demand → data request 24 h before data acquisition
- Satellite radar (SAR) data independent of the time of day and cloud coverage
- No transfer of raw data for processing → delivery of tailored products in NRT
- Products (e.g. TerraSAR-X geocoded L1b products (quicklooks) / kmz) are tailored for the needs of research vessels (e.g. location of the satellite scene, acquisition time, acquisition mode)
- preferred NRT TerraSAR-X modes
  - ScanSAR mode → swath 100 km, resolution 18 m
  - Stripmap mode → swath 30 km, resolution 3 m



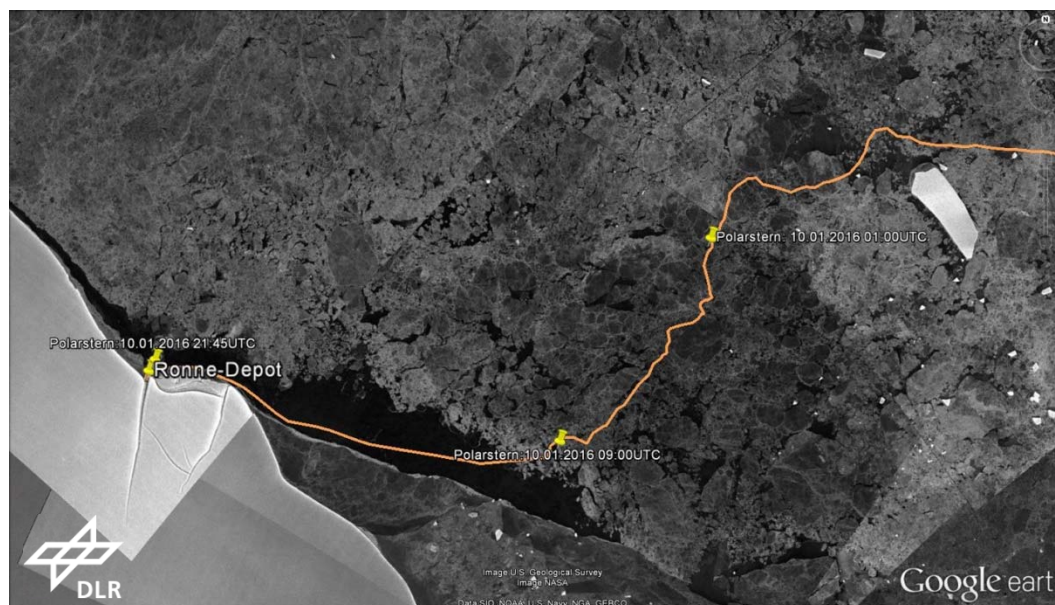
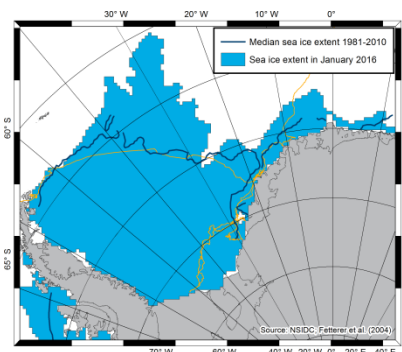


## Pilot studies for campaign support

### Antarctica/GARS O'Higgins: Support of German RV Polarstern in Jan/Feb 2016

- NRT delivery of TerraSAR-X products up to twice a day
- 30-60 min after the raw data was acquired from the satellite, information was available to the ship
- Expedition leader Michael Schröder (AWI): *"The captain and I are enthusiastic about the images. Such information is essential for this kind of route... We depend on this data; it helps us to conserve fuel, save time and avoid detours."*

#### Expedition PS96 to the Weddell Sea, Antarctica, in Jan/Feb 2016

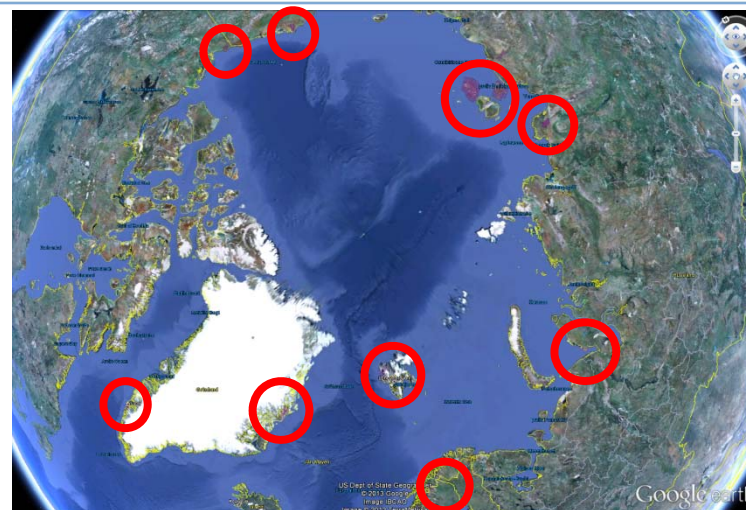


## Objective

Long-term observations of 11 key sites for polar research with high resolution dual-pol X-band SAR data

Regular observations started in 2012

2485 data takes in total (+864 since CWG-4)



## Approach

- Background mission right looking.
  - Spotlight mode (HH/VV) for Abisko and Zackenberg sites
  - StripMap mode (HH/VV, HH/HV) for Lena, Spitzbergen, Yukon, Alaska, Kytalyk, Bolshoy and Anzhu, Nuuk, Zackenberg and Marre Sale

## Metric estimates

This is a background campaign only and may vary depending on resource availability.

- TerraSAR-X AO for “Special Products” released
  - TerraSAR-X like products acquired during the TanDEM-X Pursuit Monostatic Phase (October 2014 – March 2015)
  - Data acquired during DRA mode campaigns





- TanDEM-X Global DEM production completed
- TanDEM-X DEM-AO released, open until December 1<sup>st</sup>, 2016
- New mission proposal: HRWS (High Resolution Wide Swath)

Mode	TerraSAR-X		HRWS	
	Resolution	Swath	Resolution	Swath
<b>HR Spotlight</b>	0,25 x 1 m	2,5 x 5 km	0,25 x 0,25 m	10 km
<b>Spotlight</b>	1 x 1 m	5 x 10 km	0,5 x 0,5 m	20 km
<b>Stripmap</b>	3 x 3 m	30 km	1 x 1 m	70 km
<b>ScanSAR</b>	18 x 18 m	100 km	10 x 10 m	600 km
<b>Wide ScanSAR</b>	40 x 10 m	200 x 250 km	25 x 25 m	800 km