DLR/TerraSAR-X: development of IPY portofolio since the SAR coordination workshop (CSA, March 2008)

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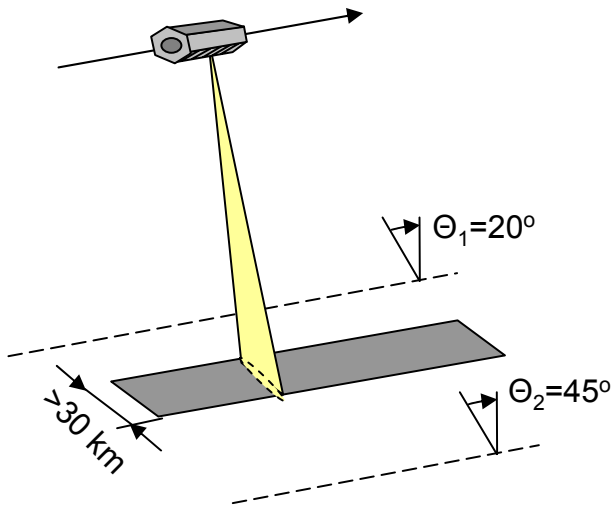
Acquisitions themes
adopted at the SAR coordination workshop 5/6 March'08 where TerraSAR-X can contribute:

1. Antarctica: pole to coast InSAR coverage in high resolution mode (4 consecutive cycles in asc and desc) in winter; pole hole mapping
2. Greenland and major Canadian icefields: InSAR acquisitions in high resolution mode (3,4 consecutive cycles in asc and desc) in winter
3. Multi- and full-polarimetric data acquisitions over common supersites

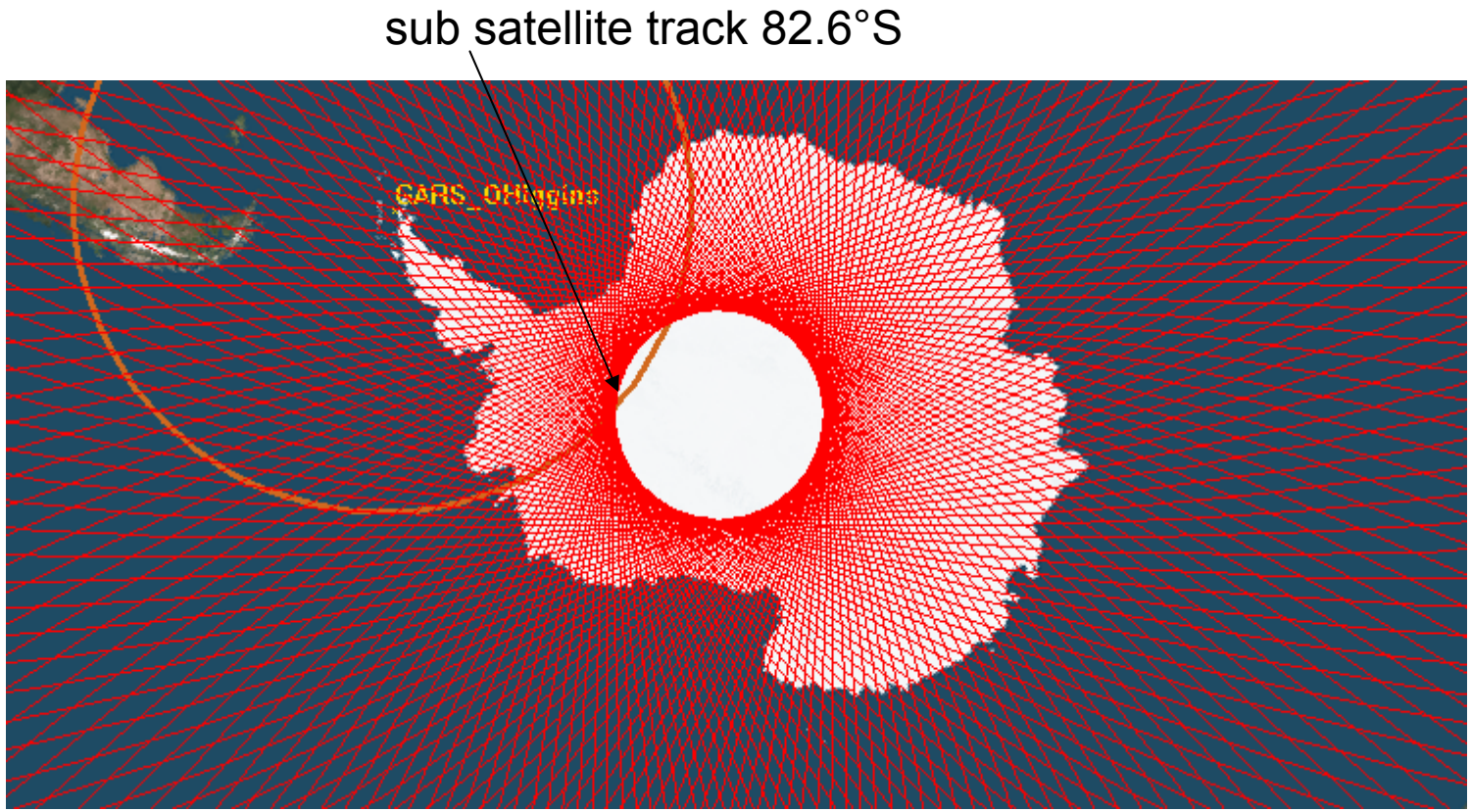
Theme 1. Antarctica: pole to coast InSAR coverage in high resolution mode

Suggested TSX acquisition mode: Stripmap (SM)



- swath width (range): **30 km** single pol. (15 km dual pol.)
- full performance incidence angle range: 20 - 45 deg (access range 15 - 60 deg)
- azimuth resolution: **3.3 m** single pol. (6.6 m dual pol.)
- ground range resolution 150 MHz chirp BW: **1.7 m - 3.5 m** (45 – 20 deg)
- nom. product length: 8 sec. (50 km). **For IPY up to 60 sec. possible (350 km)**
- *polarizations:* **single** HH or **VV**, dual (HH/VV), (HH/HV) or (VV/VH)

TerraSAR-X maximum coverage towards the South pole



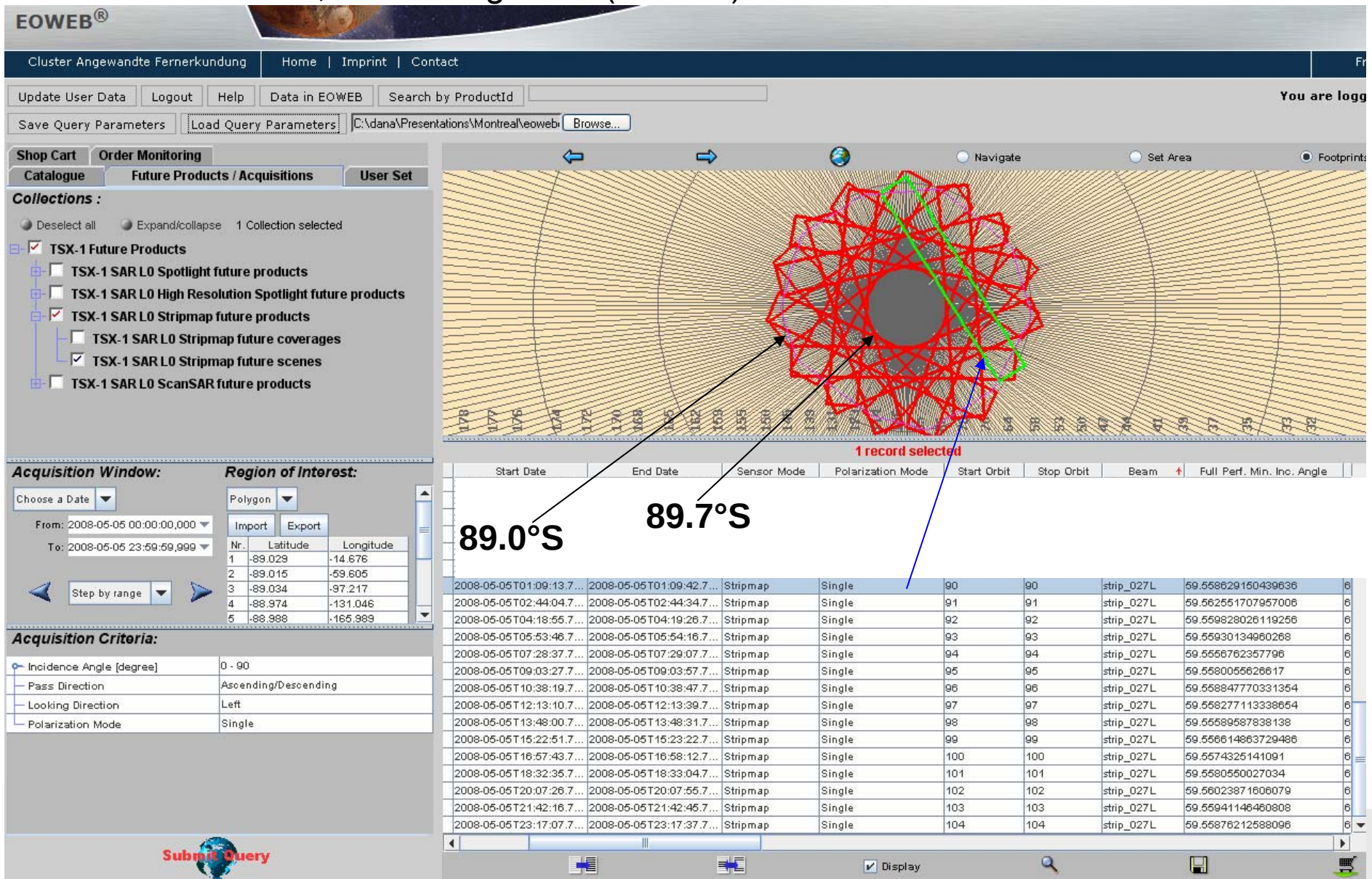
Stripmap mode:

Nominal mode: **right looking** and full performance beam (inc. angle 20 deg, strip_003) up to **81°S** possible

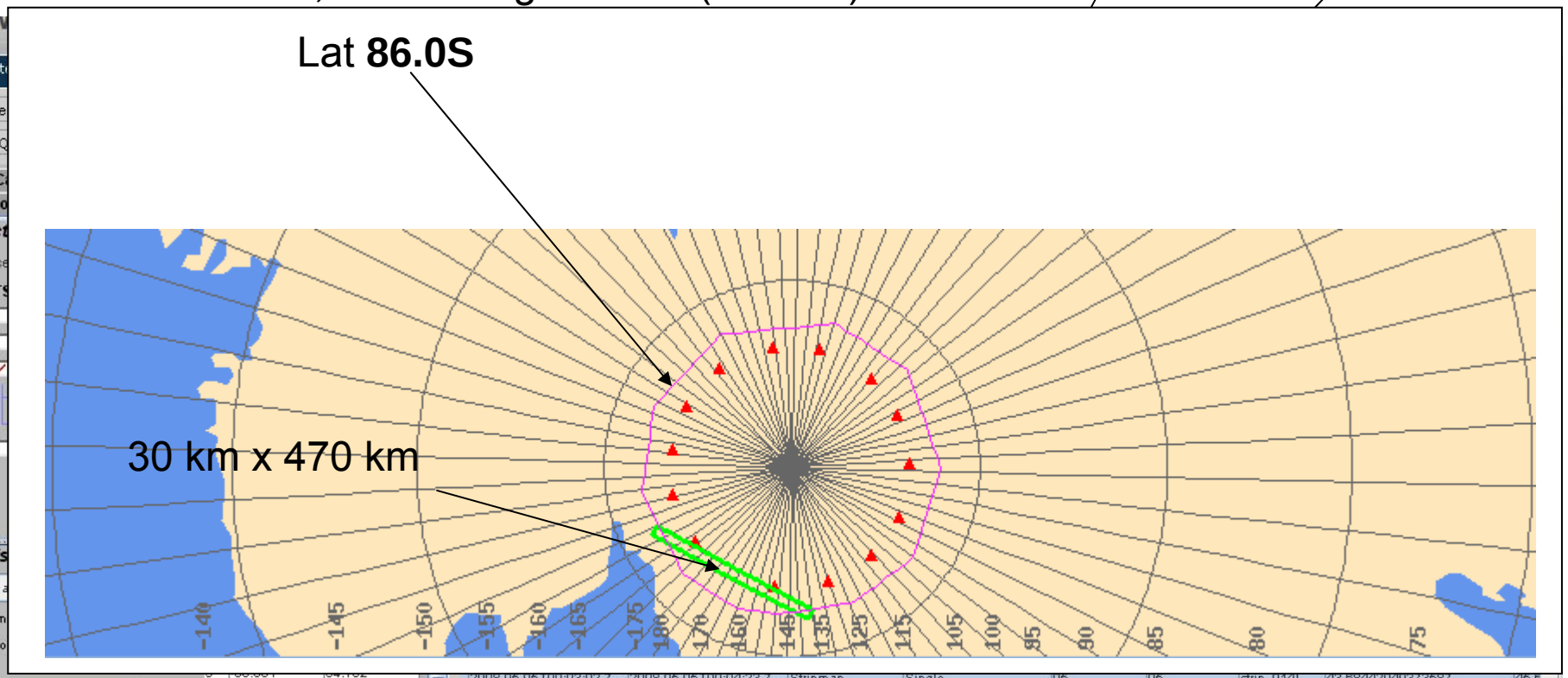
Left looking and full performance beam (inc. angle about 45 deg, strip_014) up to **87.1°S** possible

Left looking and max. access range (inc. angle 60 deg, strip_027) up to **89.7°S**

Left looking EOWEB Request simulation (1):
1 day (05.5.2008), one beam/orbit (no conflicts) 60°inc. angle (max.possible);
Region of interest: South of **89.0°S**
Result: 15 scenes, scene length 30” (190 km).



Left looking EOWEB Request simulation (2):
1 day (05.5.2008), one beam/orbit (no conflicts) 44° inc. angle (nominal product)
Region of interest : South of **86.0°S**
Result: 15 scenes, scene length 1' 15" (470 km).



Update
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Step by range

10	-86.041	58.939
11	-85.995	18.544
12	-86.029	-14.676

Acquisition Criteria:

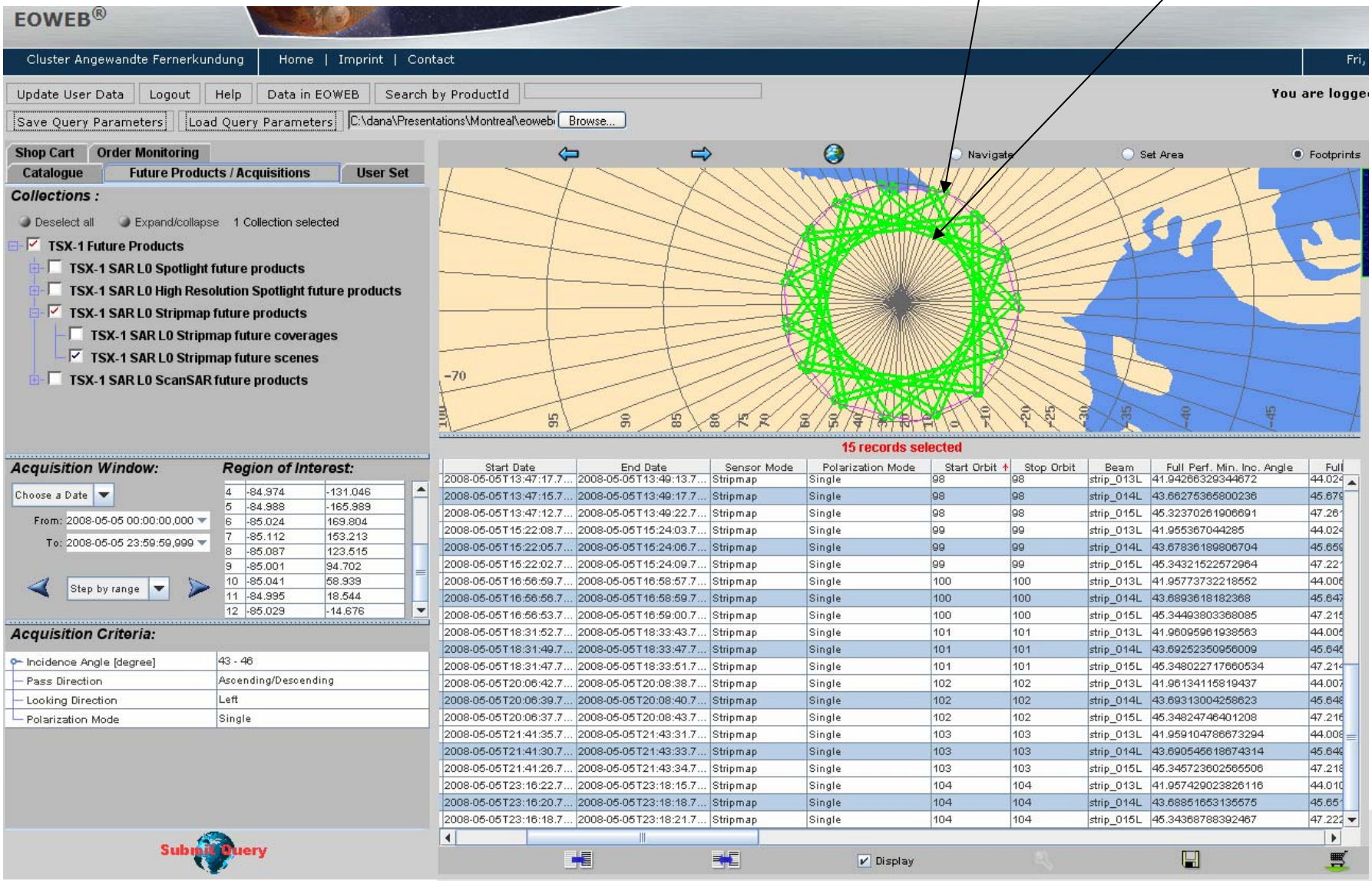
Incidence Angle [degree]	43 - 46
Pass Direction	Ascending/Descending
Looking Direction	Left
Polarization Mode	Single

Submit Query

2008-05-05T10:37:55.7...	2008-05-05T10:39:13.7...	Stripmap	Single	96	96	strip_014L	43.68374492638458	45.6
2008-05-05T12:12:46.7...	2008-05-05T12:14:01.7...	Stripmap	Single	97	97	strip_014L	43.67057250090721	45.6
2008-05-05T13:47:33.7...	2008-05-05T13:48:54.7...	Stripmap	Single	98	98	strip_014L	43.69059116773415	45.6
2008-05-05T15:22:25.7...	2008-05-05T15:23:47.7...	Stripmap	Single	99	99	strip_014L	43.69096202393962	45.6
2008-05-05T16:57:22.7...	2008-05-05T16:58:35.7...	Stripmap	Single	100	100	strip_014L	43.69155784430174	45.6
2008-05-05T18:32:10.7...	2008-05-05T18:33:25.7...	Stripmap	Single	101	101	strip_014L	43.69252350956009	45.6
2008-05-05T20:06:59.7...	2008-05-05T20:08:22.7...	Stripmap	Single	102	102	strip_014L	43.69341612880892	45.6
2008-05-05T21:41:54.7...	2008-05-05T21:43:09.7...	Stripmap	Single	103	103	strip_014L	43.692414923298585	45.6
2008-05-05T23:16:46.7...	2008-05-05T23:17:58.7...	Stripmap	Single	104	104	strip_014L	43.691680859161494	45.6
2008-05-05T01:08:45.7...	2008-05-05T01:10:12.7...	Stripmap	Single	90	90	strip_015L	45.35218810713823	47.2
2008-05-05T02:43:37.7...	2008-05-05T02:45:00.7...	Stripmap	Single	91	91	strip_015L	45.354156989216136	47.2
2008-05-05T04:18:28.7...	2008-05-05T04:19:52.7...	Stripmap	Single	92	92	strip_015L	45.347753049273685	47.2
2008-05-05T05:53:21.7...	2008-05-05T05:54:46.7...	Stripmap	Single	93	93	strip_015L	45.315168797708836	47.2
2008-05-05T07:28:10.7...	2008-05-05T07:29:35.7...	Stripmap	Single	94	94	strip_015L	45.29877410560743	47.2

Display

Left looking EOWEB Request simulation (3):
1 day (05.5.2008), one beam/orbit (no conflicts), 44° inc. angle
Region of interest : South of **85.0°S**
Result: 15 scenes, length 2 min.



TerraSAR-X left looking (LL) mode:

Successfully tested for single scenes but not for large areas:

•impact on mission operations (solar antenna, SAR antenna orientations)

•products have degraded performance

Scientific community: should give a detailed planning of the acquisitions (areas, incidence angle, polarization, priorities, period of the acq.). 4 successive cycles (11 day repeat pass) or with longer interval?

DLR:

•looks which Antarctic regions desired by the IPY - community can be acquired in one 11-days cycle

•consultancy of EADS - Astrium (constructor) for larger acquisitions in LL mode

•checks other restrictions for the proposed dates (orbit usage, maintenance phases, eclipse)

Theme 3. Multi-frequency (C-, L-, X) and fully polarimetric data acquisitions over common supersites

Dual receive antenna (DRA) configuration – experimental mode of TerraSAR-X:

•DRA tests are planned for summer 2008, for fully polarimetric and along track interferometry imaging.

•Test sites for fully polarimetric acquisitions can be proposed (through D. Floricioiu). **IPY - supersites** selected by the scientific community are welcome (applications: sea ice, permafrost, glacier facies, SWE). Deadline 10 June 2008.

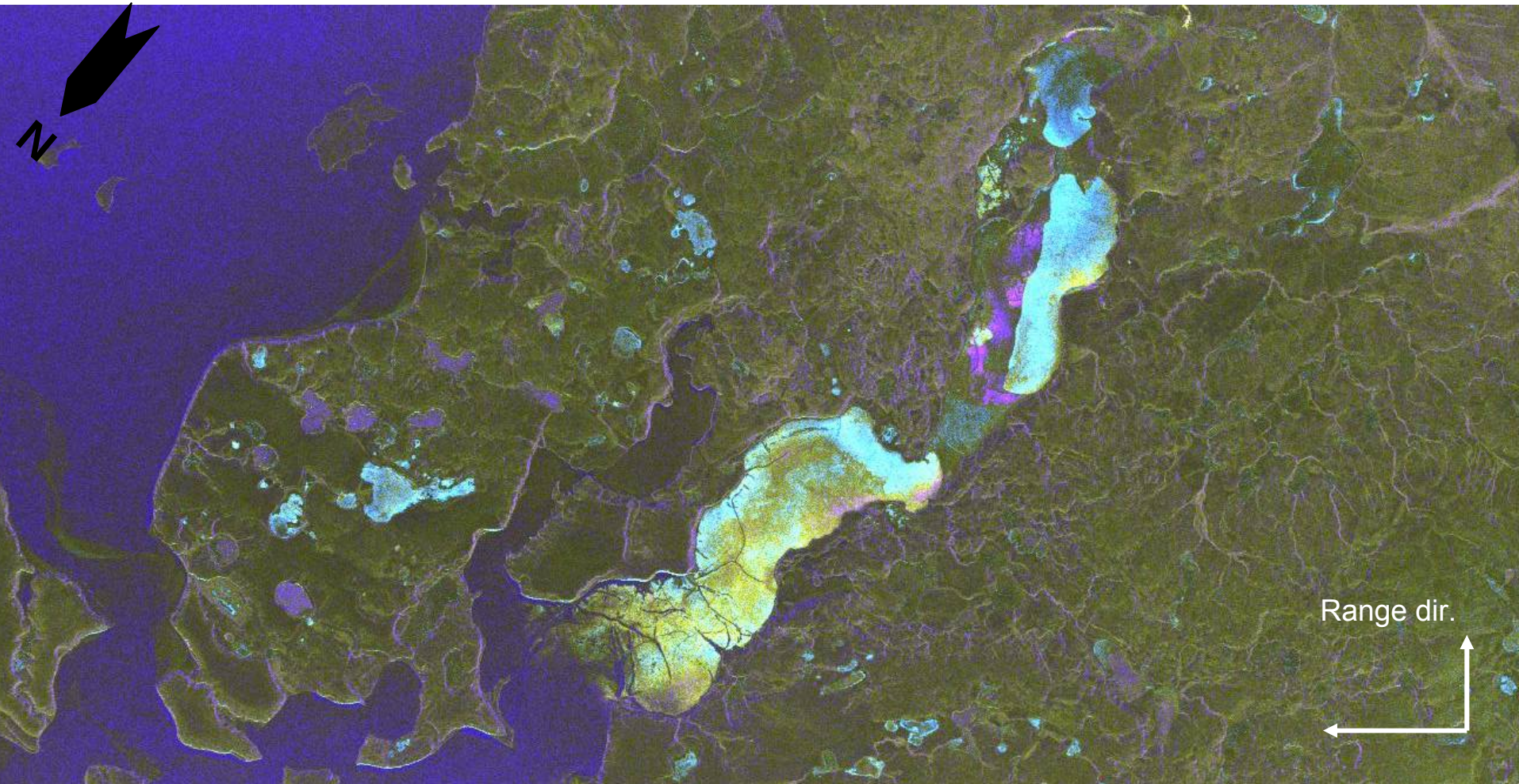
•Quad pol TerraSAR-X acquisitions: in **August 2008**

Recent TSX acquisitions for the IPY project on state and fate of the Canadian cryosphere: region Inuvik; mode stripmap, dual pol VV/VH, 6 test sites

Husky Lake 68.8N 133.1W; 6 April 2008

41 deg inc. angle

VH,VV,VH-VV

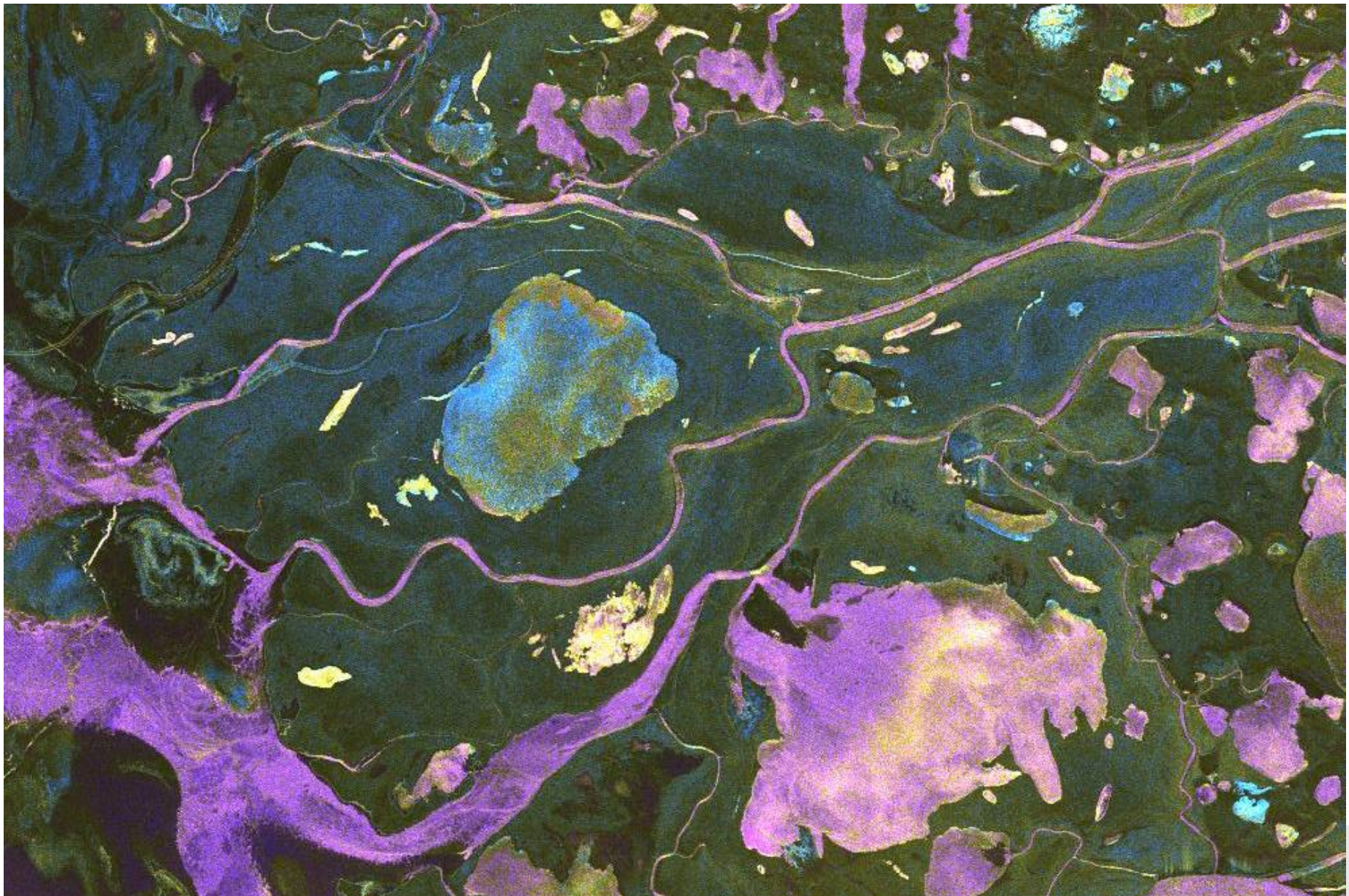


Inuvik Campaign – Site: Delta 69.4N 135.2W; 25 April 2008

23 deg inc. angle

VH,VV,VH-VV

DT 5073



Access to TerraSAR-X data for scientific use in IPY

- Pre-launch accepted proposals (status 29.04.2008):
  - ☺ COA0195 Ronald Saper (Vantage Point International) *active*
  - ☺ HYD0270 Alexander Braun (University of Calgary) *active*
  - LAN0066 Kenneth Jezek (Ohio State University) *not active*
  - ☺ LAN0013 Mathias Braun (University of Bonn) *active*
  - ☺ MTH0123 Wolfgang Dierking (AWI) *active*
  - ☺ MTH0176 Kjell Arild Hogda (Norut IT) *active*
  - ☺ OCE0116 Detlev Stammer (University of Hamburg) *active*

New IPY related science proposals for TerraSAR-X submitted since March 2008

Ice velocity:

- ☺ HYD0377 Ian Joughin (Univ of Washington) - accepted

Greenland glaciers and Antarctica, if LL possible: Whillans and Kamb ice streams

Should we gather/acquire all LL sites for IPY in the common DLR - IPY proposal?

- HYD0396 Dana Floricioiu (DLR)

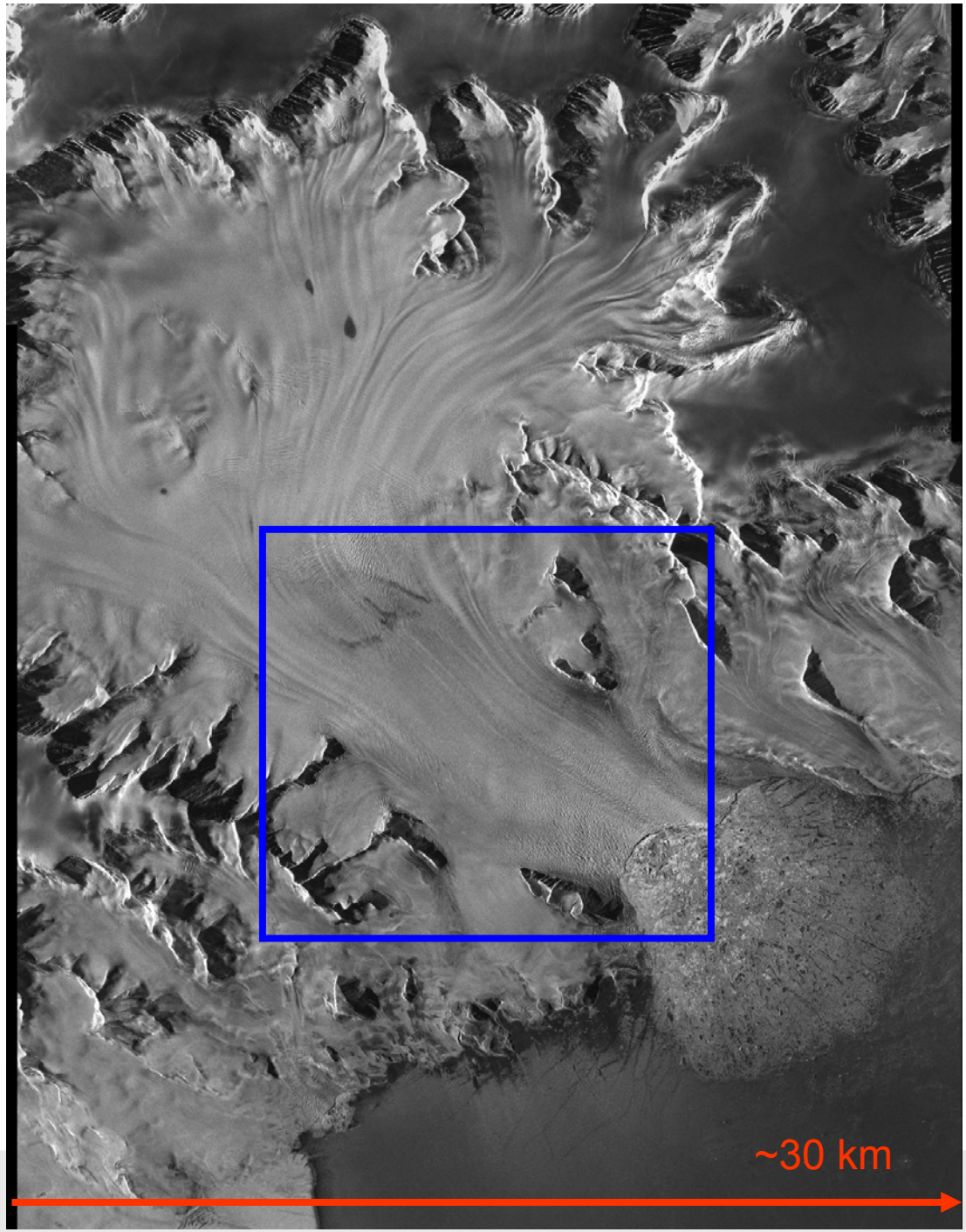
Antarctic peninsula – outlet glaciers around Larsen A and B

Stripmap, single polarization

Drygalski glacier, Antarctic peninsula, 08.10.2007

Polarisation: HH

Incidence Angle: 37 deg (beam:strip_010 R)




TerraSAR-X stripmap mode
8.10.07
Envisat ASAR image mode (30 m res.)