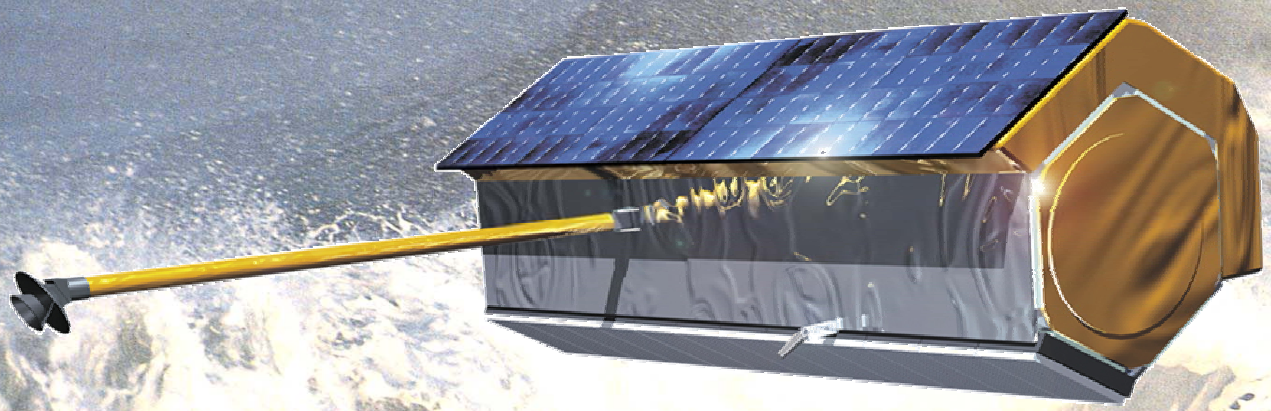
TerraSAR Oceanography



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Introduction

- **TerraSAR-X: A high-resolution, next generation X-Band radar satellite**
  - **TerraSAR-X is the scientific/technological continuation of the highly successful missions X-SAR (1994) and SRTM (2000)**
  - **Continuation of ERS/ENVISAT/RADARSAT data (?)**
  - **launch planned for October 2005**

- **main mission goals are:**
  - **provision of TerraSAR-X data and products for scientific applications**
  - **commercial exploitation of remote sensing data**

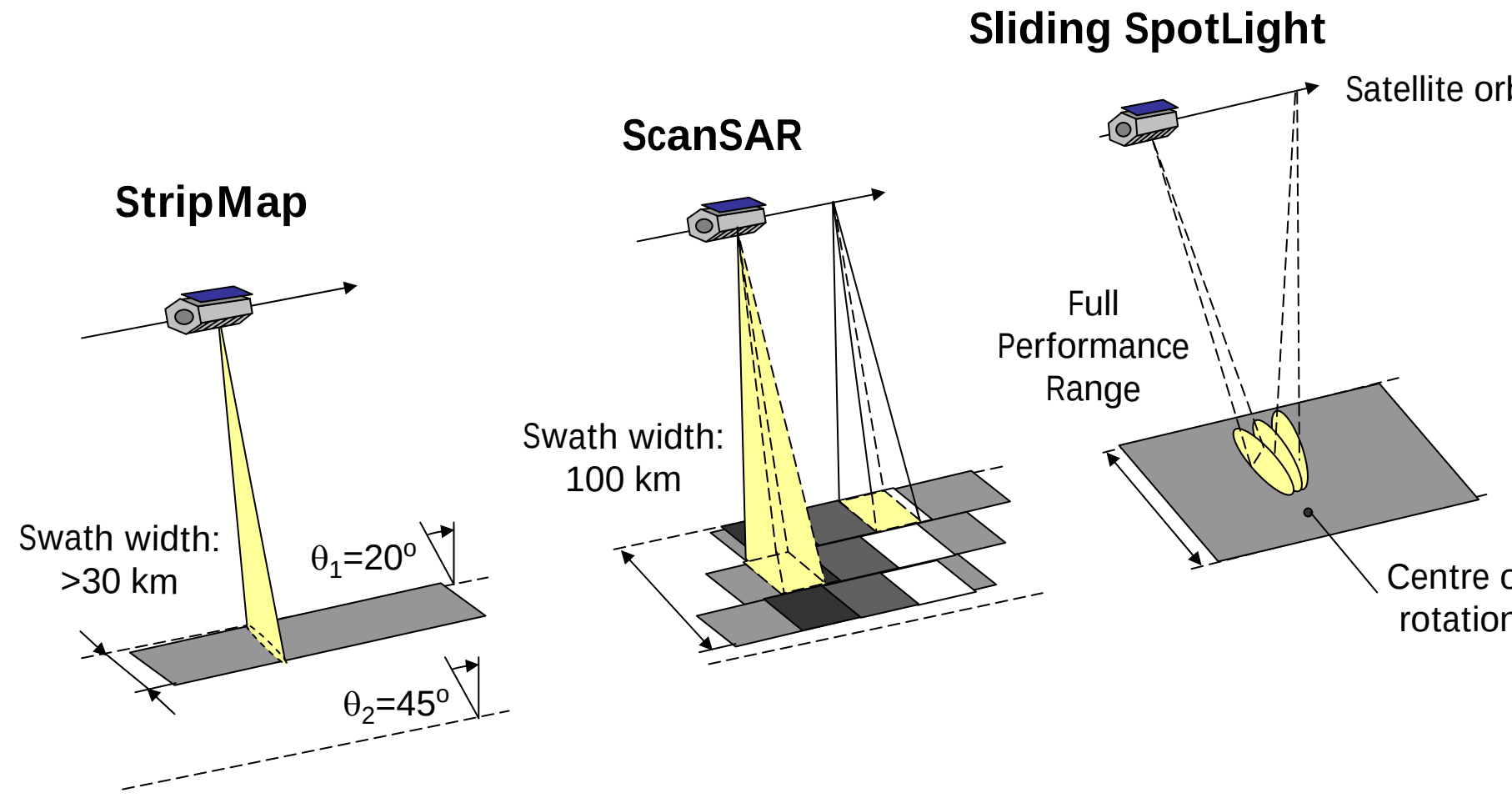
» Public Private Partnership (PPP)

Simulated TerraSAR-X Image

Testsite Oberpfaffenhofen (1,5 m resolution)

ESAR X-band data

TerraSAR-X Imaging Modes



TerraSAR-X Products (Overview)

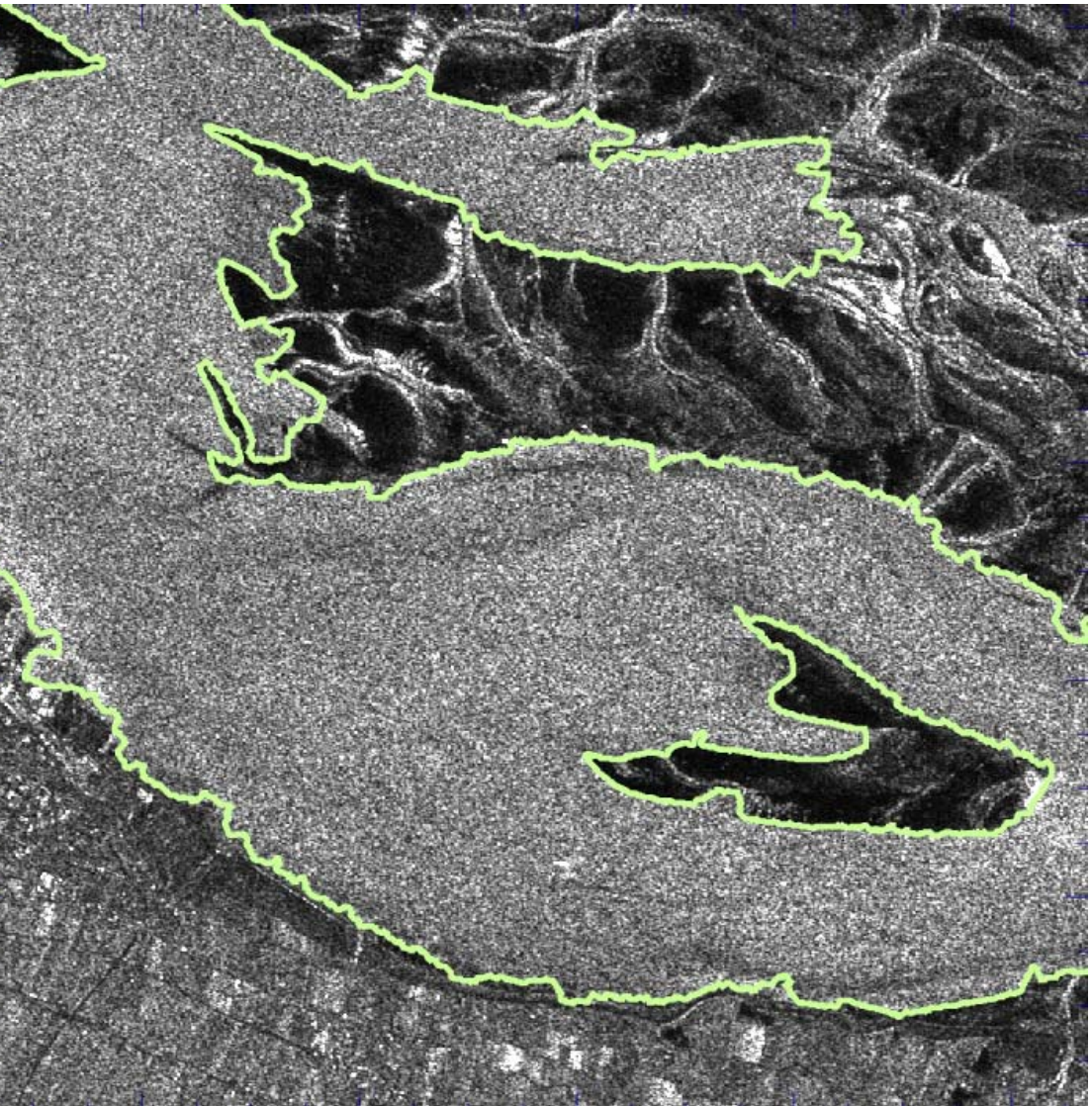
Product	Coverage [az x rg]	Resolution [az x rg]	Polarization	Full Performance Range
HR SpotLight	5 x 10 km^2	1.0 m x (1.5 – 3.5 m)	single, dual, quad	20 – 55 °
Spotlight	10 x 10 km^2	2.0 m x (1.5 – 3.5 m)	single, dual, quad	20 – 55 °
StripMap	≤1650 km x 30 km	3.0 m x (1.7 – 3.5 m)	single	20 – 45 °
StripMap (polarimetric)	≤1650 km x 15 km	6.0 m x (1.7 – 3.5 m)	dual, quad	20 – 45 °
ScanSAR	≤1650 km x 100 km	16.0 m x (1.7 – 3.5 m)	single, dual, quad	20 – 45 °
300 MHz Exp.-Mode Spotlight	5 x 10 km^2	1.0 m x (0.6 – 1.5 m)	single, dual, quad	20 – 55 °
Dual Receive StripMap	≤1650 km x 30 km	1.5 m x (1.7 – 3.5 m)	single, dual, quad	20 – 45 °
ATI		Acc. 15-60 km/h		

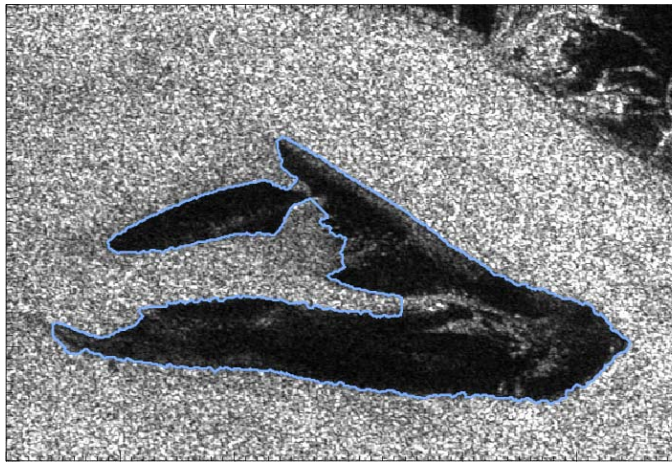
Experimental only

TerraSAR-X: New Imaging Opportunities

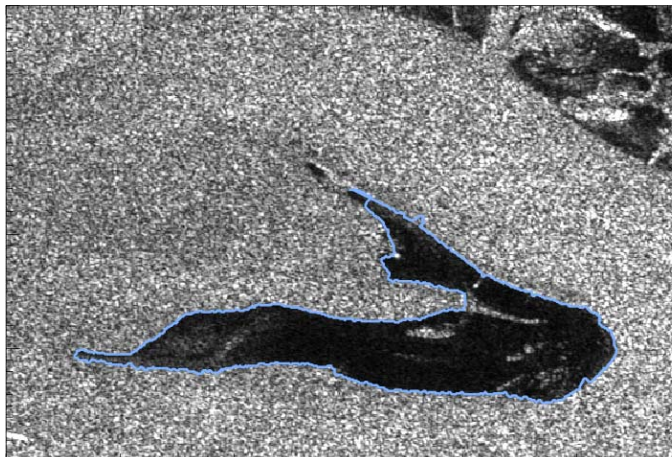
- **multi-mode observation capability**
  - **SpotLight**
  - **StripMap**
  - **ScanSAR**
- **look angles:**
  - **20°-55° incidence angle**
  - **right/left looking**
- **polarization**
  - **Single, dual & quad (experimental)**
- **further experimental capabilities**
  - **300 MHz mode for very high range resolution by doubling the chirp bandwidth**
  - **dual receive antenna mode (two independent antenna/receiver elements)**
    - **=> Along Track Interferometry (ATI)**
    - **=> Quad polarization**
- **R/V ratio = 80 sec (cf. ERS: 110 sec)**

Coastline Detection





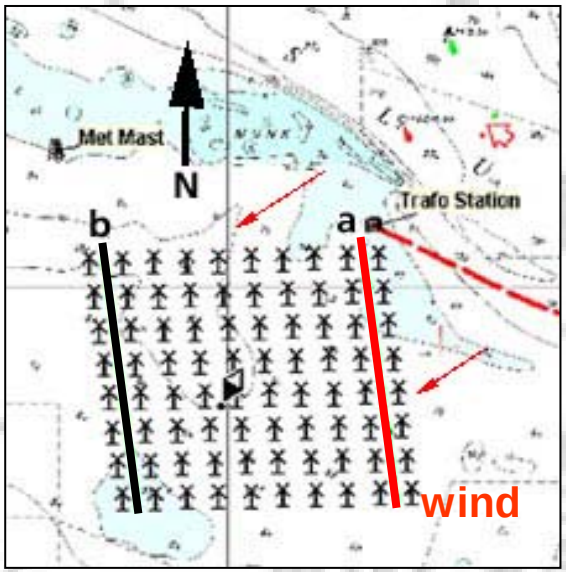
different tidal situations

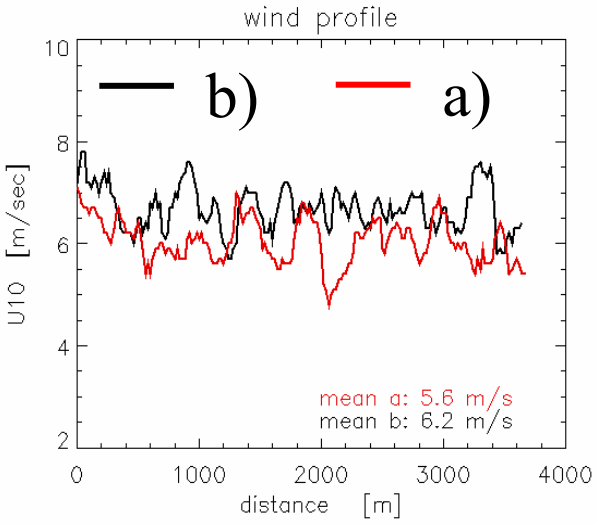


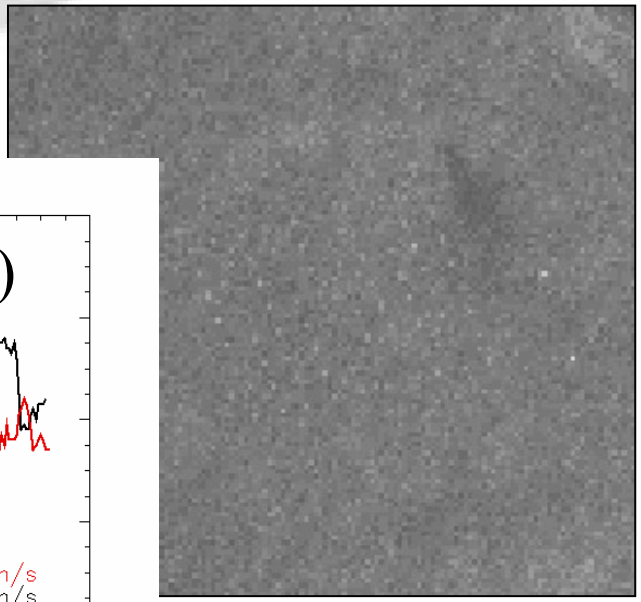
Offshore Wind Farming

Zoom from SAR scene

Offshore wind park Horns Rev



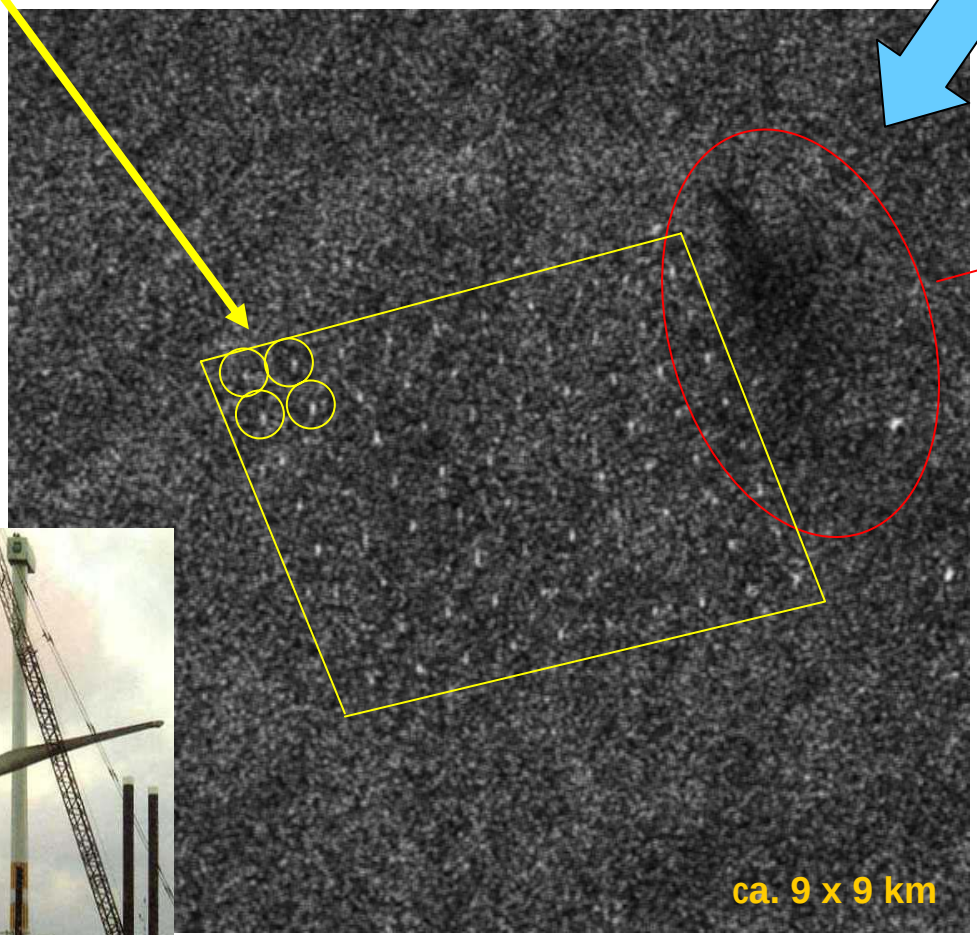




ERS High Resolution Windfields, Horns Rev Windpark

Turbines

Wind (6 m/s)



Windblockage

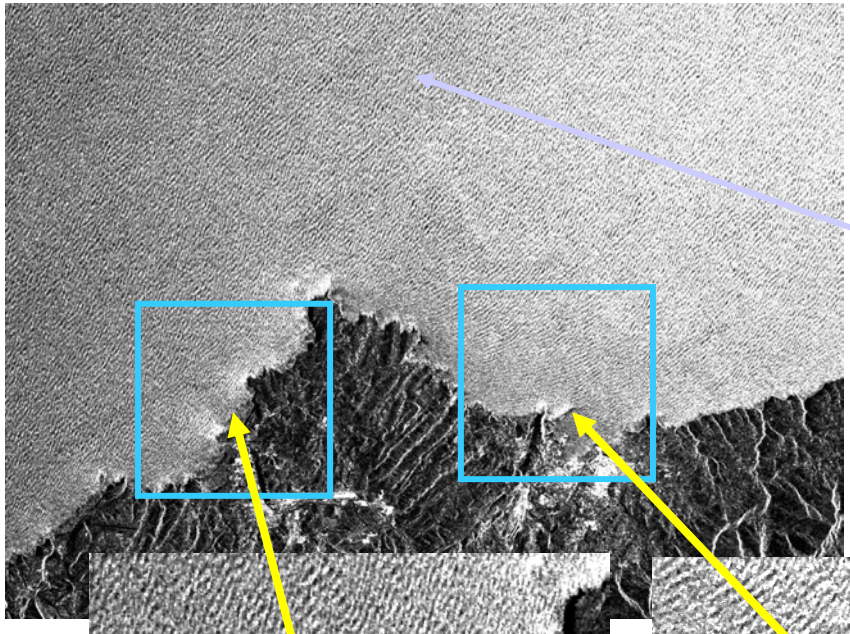
SAR Szene e2_39040_2493
8-10-2002, 10:26 UTC

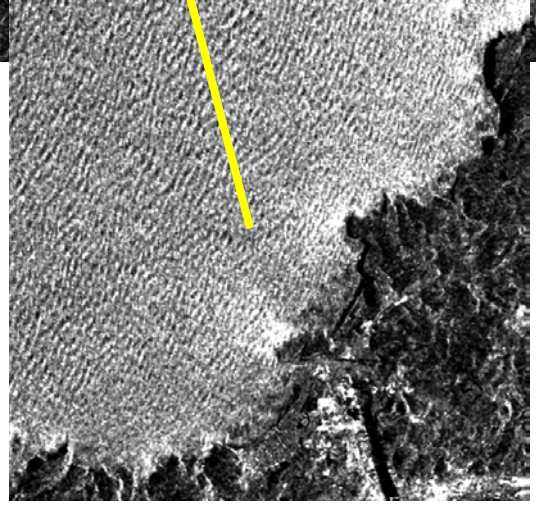
Separation distance: 560 m

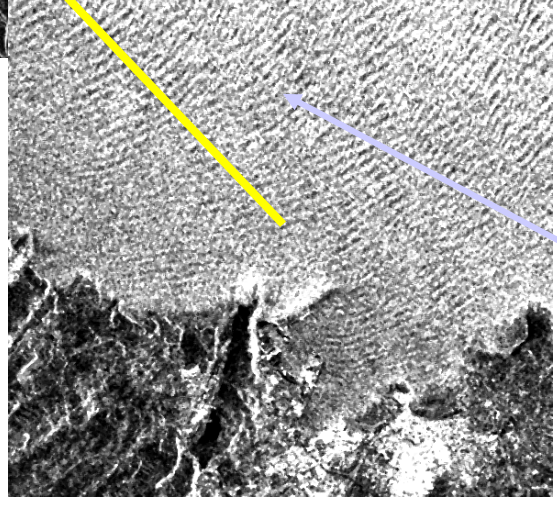
Develop X Band Wind Algorithms

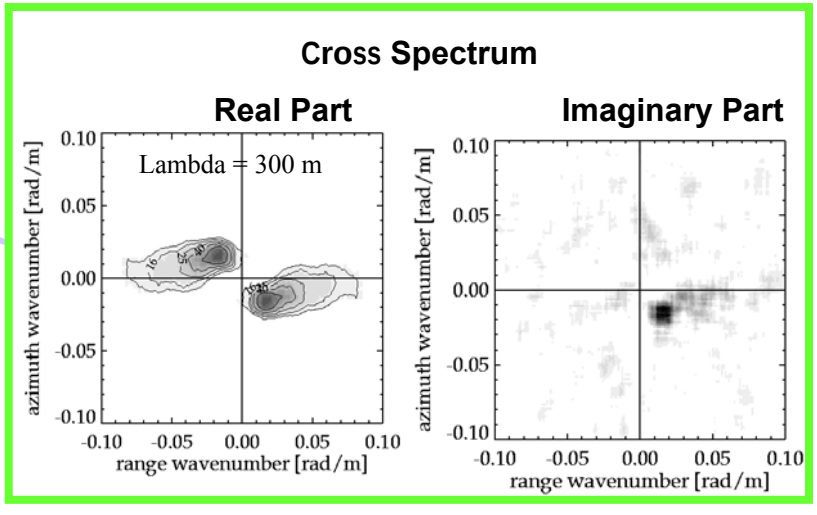
Ocean Wave fields

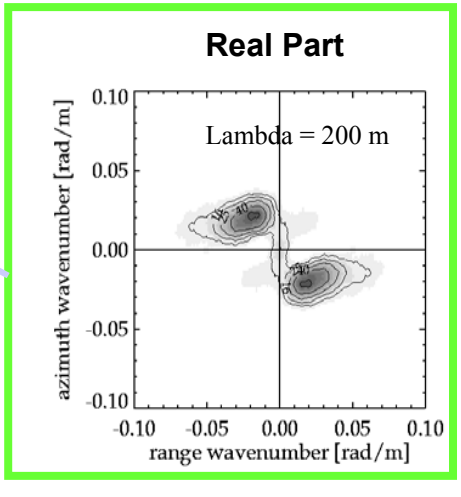
35 x 20 km ERS-2 SAR image acquired on April 13, 1999, 11:11 UTC



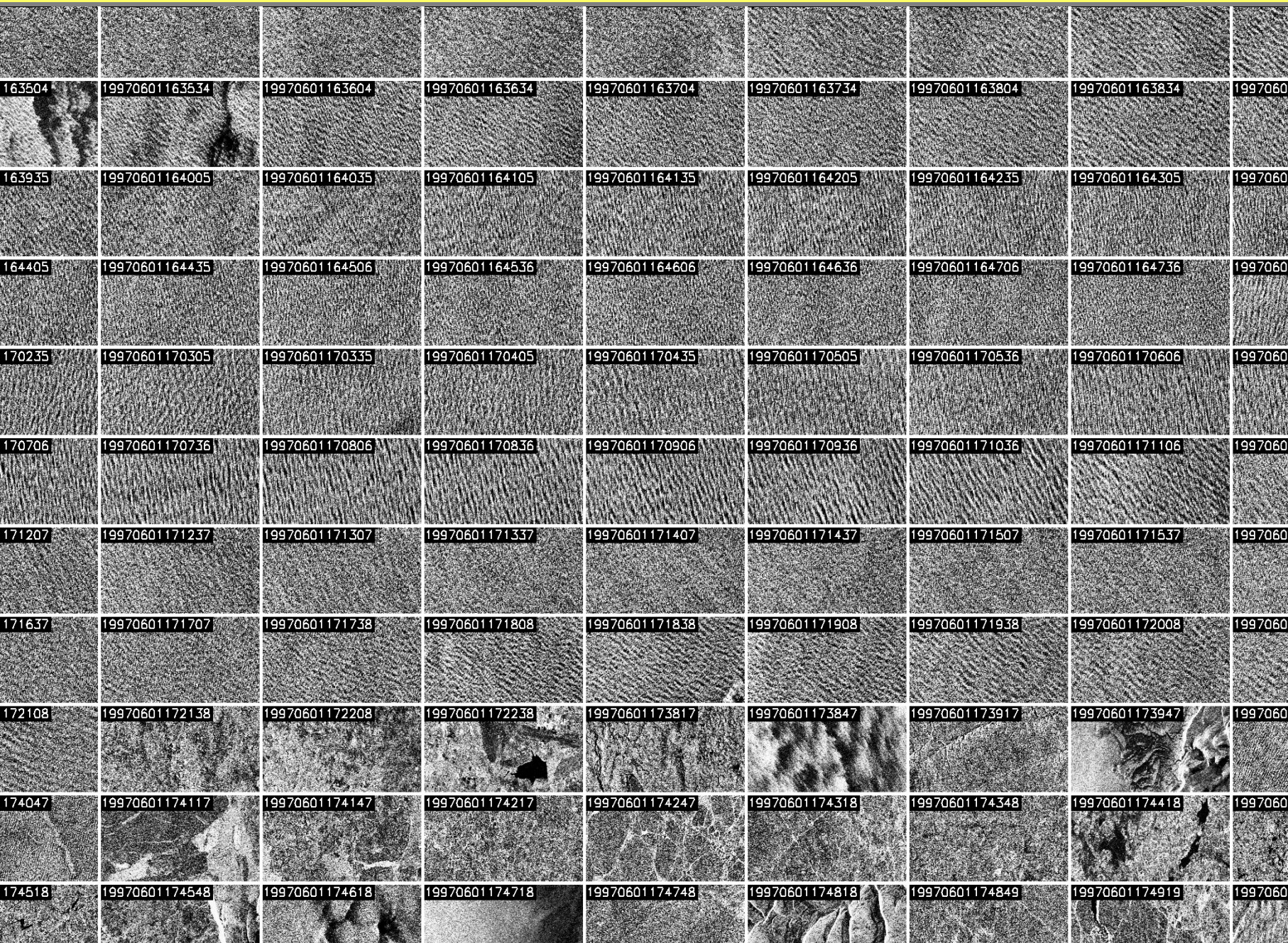






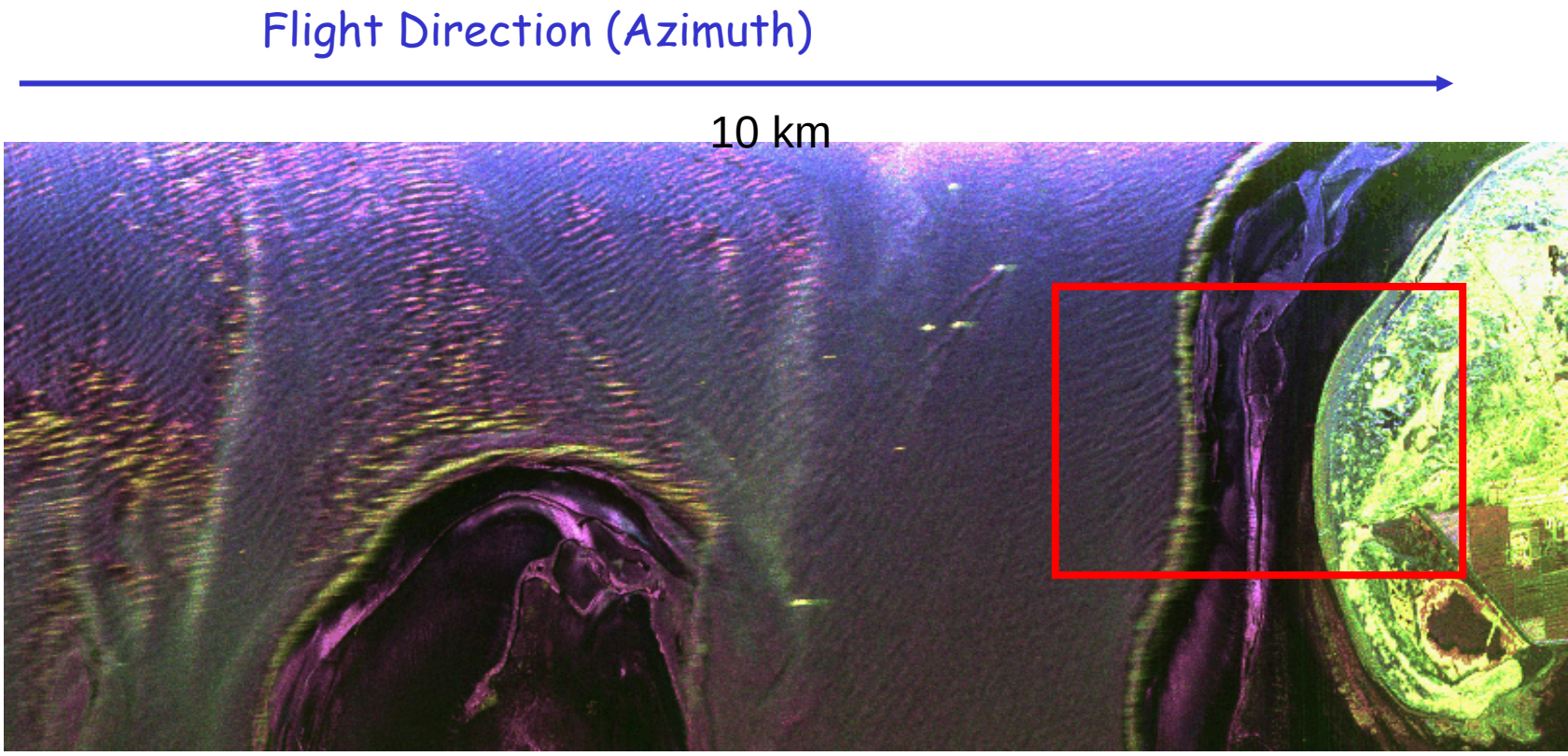


But: So far no Wave Mode in TerraSAR X !

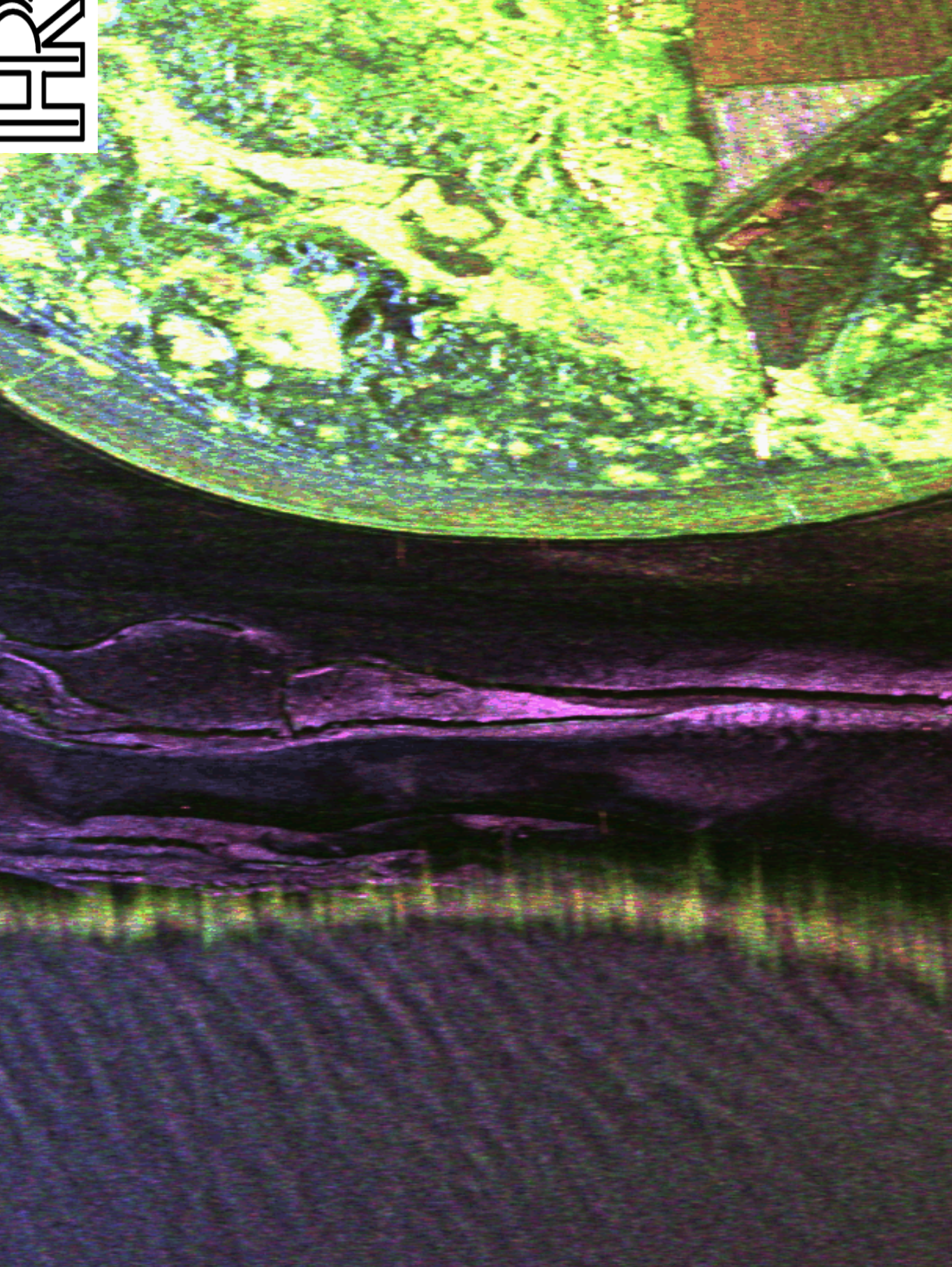


Pauli-RGB Image @ L-band

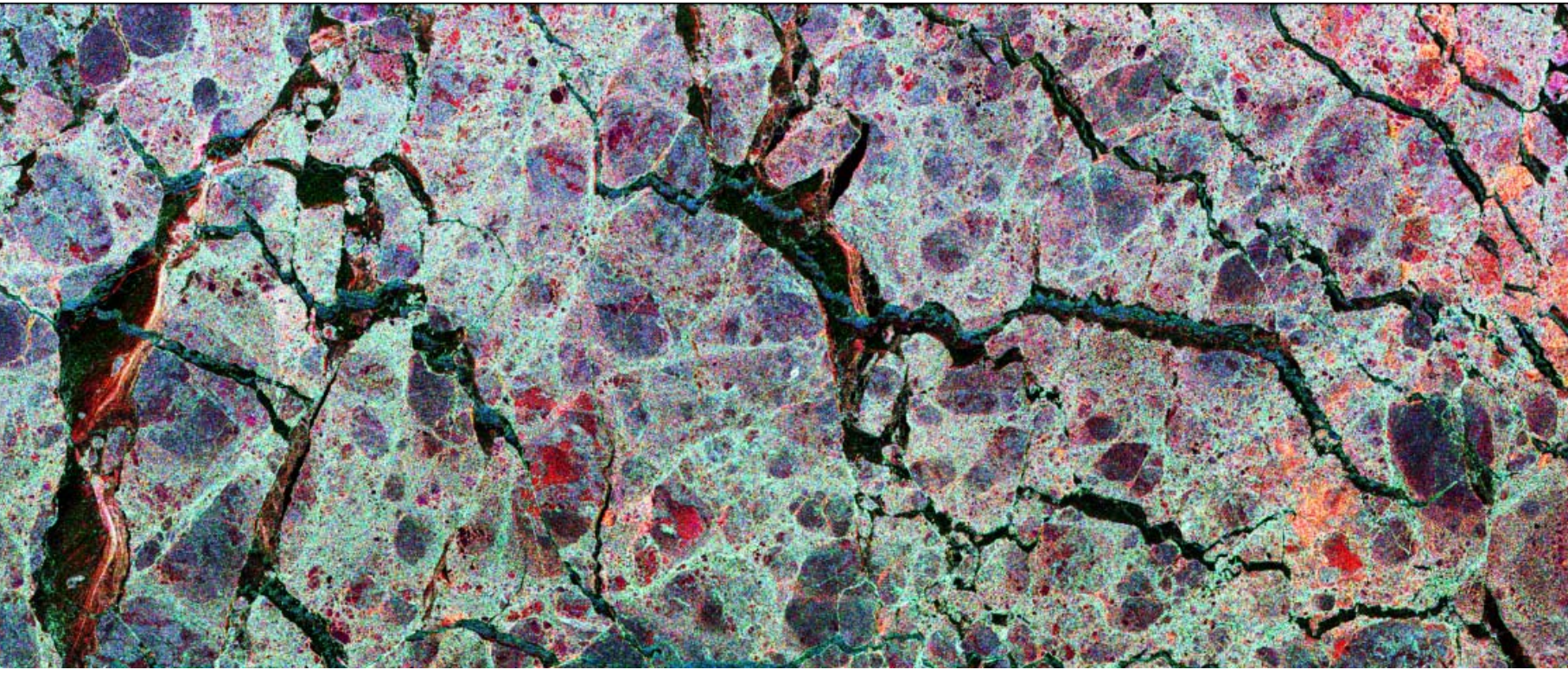
RGB - Pauli components (red=HH-VV, green= 2HV, blue=HH+VV)



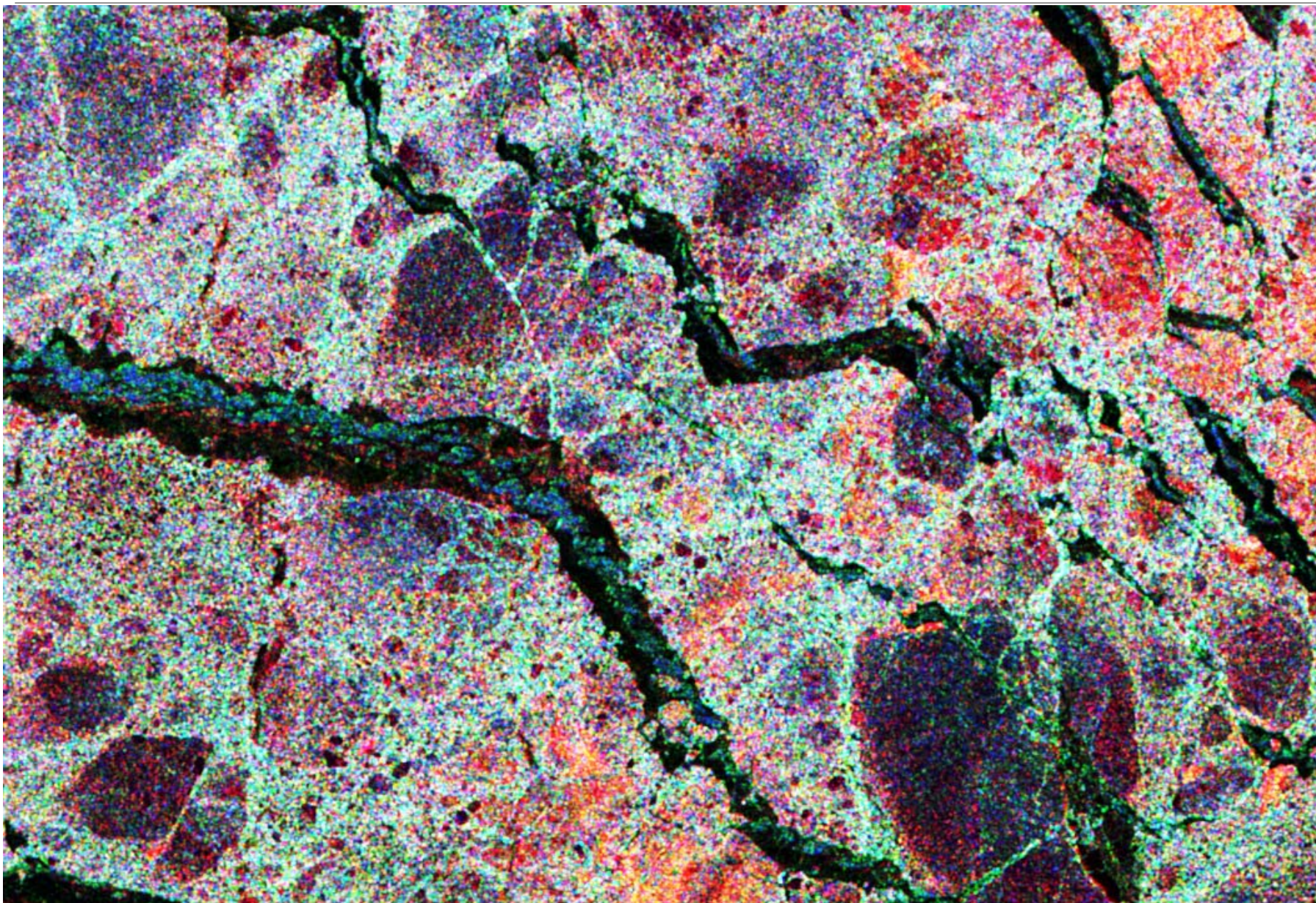
ESAR Aircraft Data, From I.Hajnsek, DLR



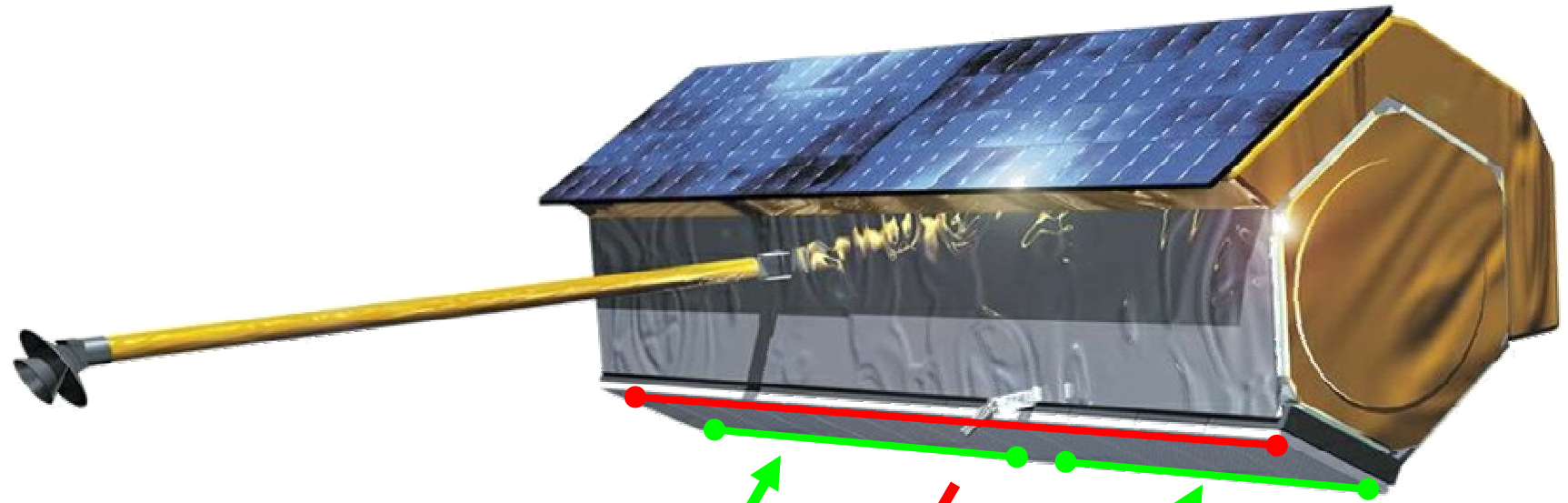
SIR-C Quadpol Data of Weddell Sea Ice

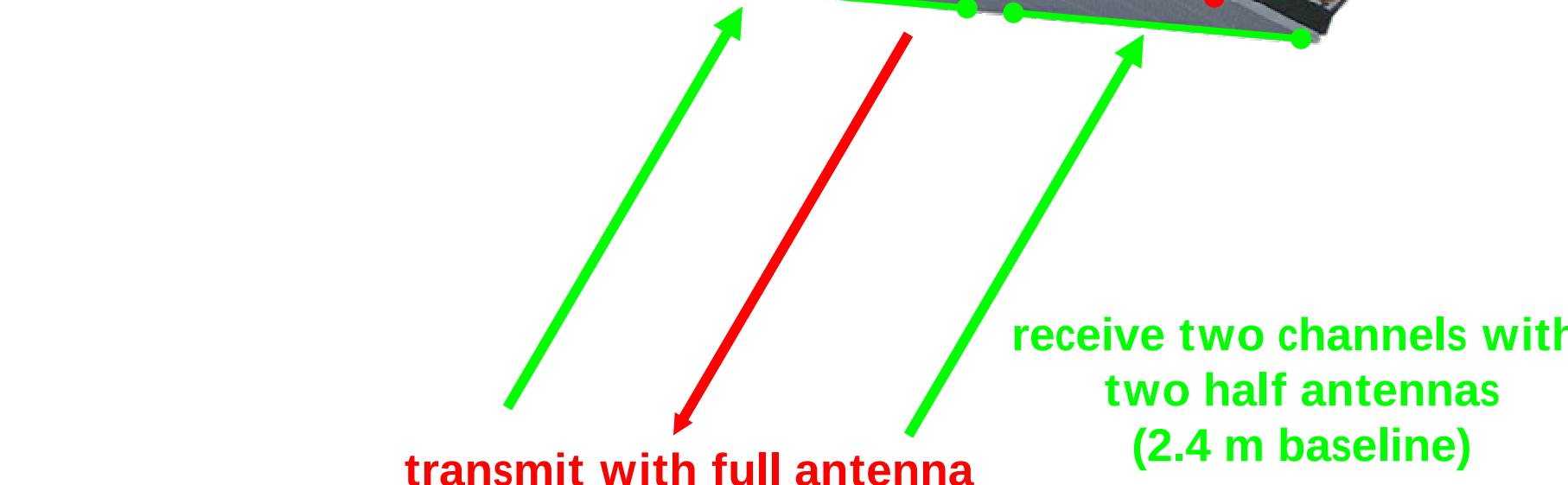


SIR-C Quadpol Data of Weddell Sea Ice, Full Resolution

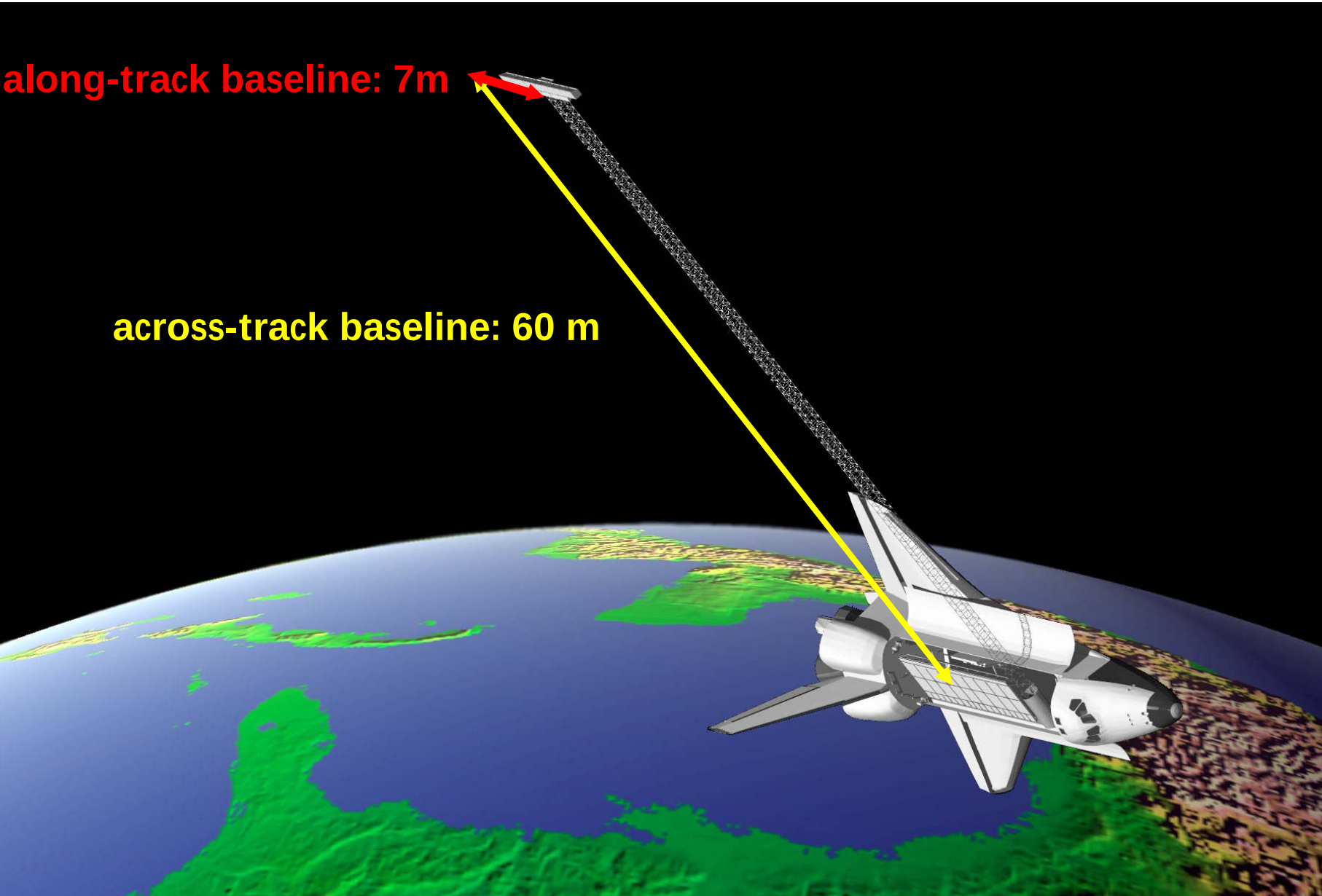


TerraSAR-X – Dual Receive Antenna

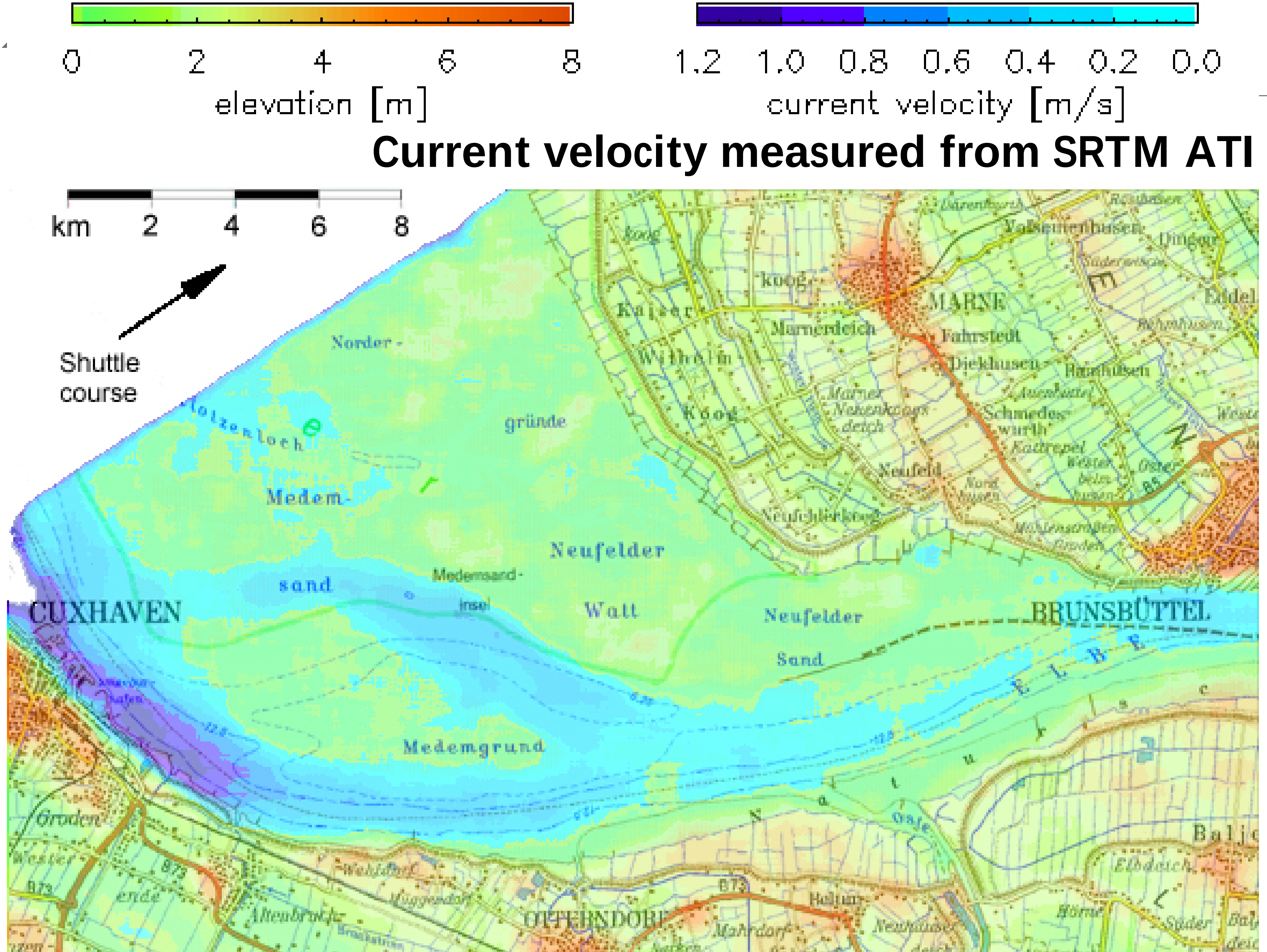




SRTM Geometry and Velocity Sensitivity



Current velocity measured from SRTM ATI



Preparation of the Scientific Use

• 1st science team meeting	December 2003
• implementation of the TX Science Plan	June 2004
• Announcement of Opportunity	September 2004
• proposal deadline	December 2004
• proposal review	March 2005
• 2nd Science Team Meeting	June 2005
• launch	October 2005

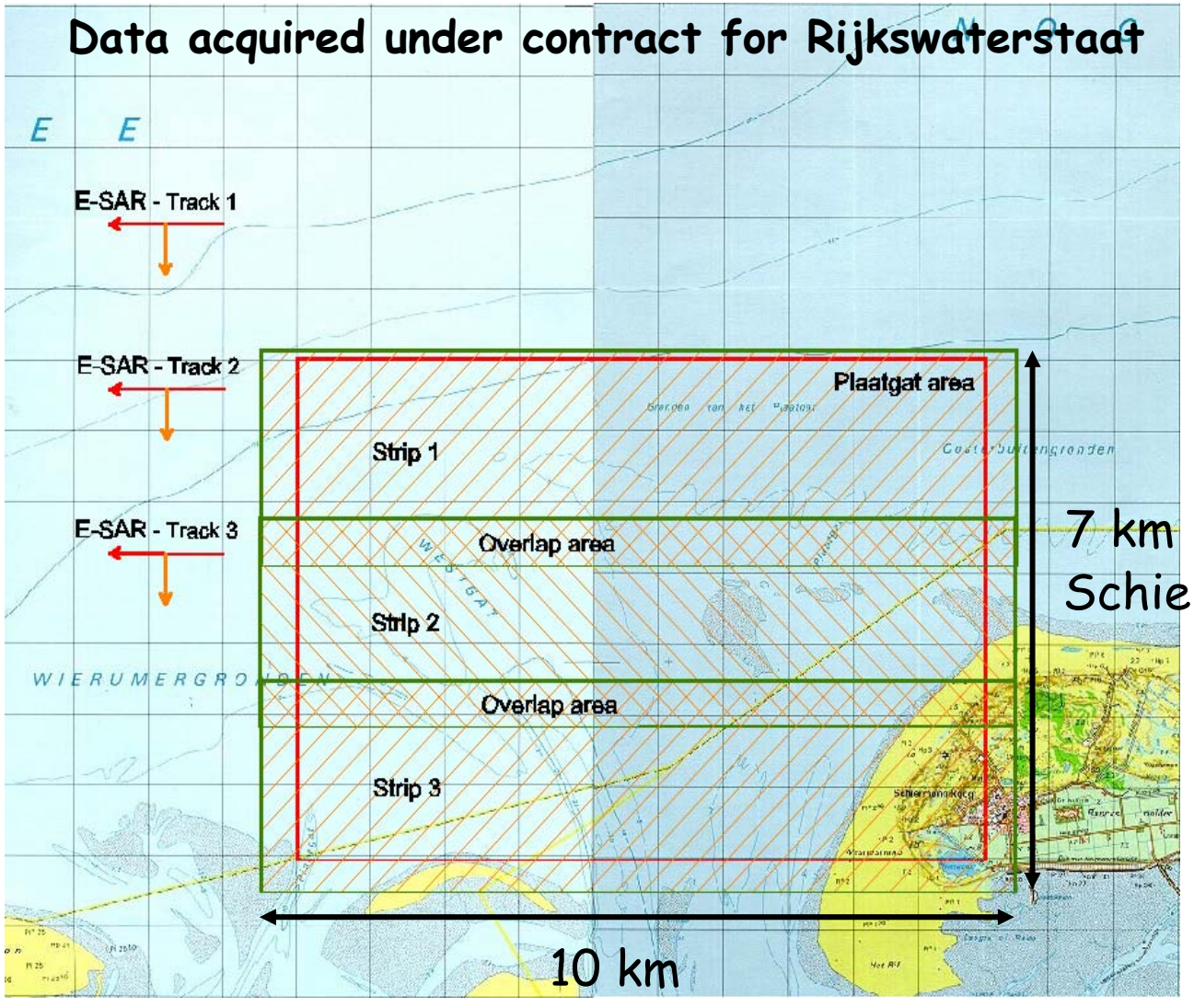
Summary

- interesting features for oceanographic applications
  - high resolution
  - multi-polarization
  - different modes
  - short revisit time (double sided): 100% 4.5 days
    95% 2.5 days
  - InSAR capability
  - important to create wave mode

- launch planned for October 2005
- first science team meeting planned for December 2003
- AO in September 2004
- migration of X/C/L band algorithms

Test Area Plaatgat (Dutch Plaatgat) 2002

Weather condition: wind speed at 10 m height of 5-7 m/s



Alpha Angle / Entropy @ L-band