

# GeoForum MV 2010 Workshop

## Ship Detection Service

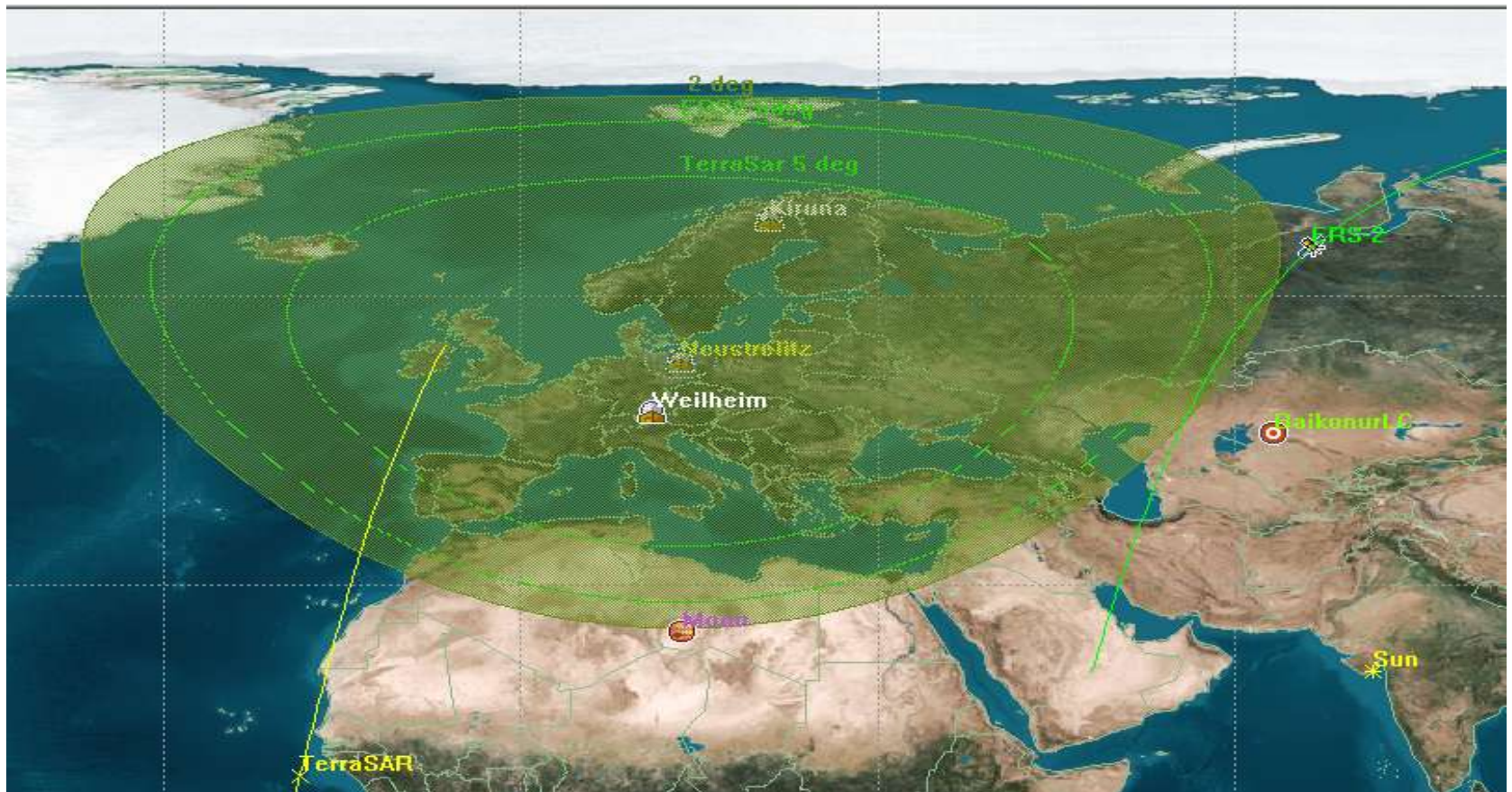
**Susanne Lehner, Stephan Bruschi, Egbert Schwarz**  
**DLR Cluster Angewandte Fernerkundung**



DLR

Deutsches Zentrum  
für Luft- und Raumfahrt e.V.  
in der Helmholtz-Gemeinschaft

# Horizontmaske TerraSAR-X und ERS-2

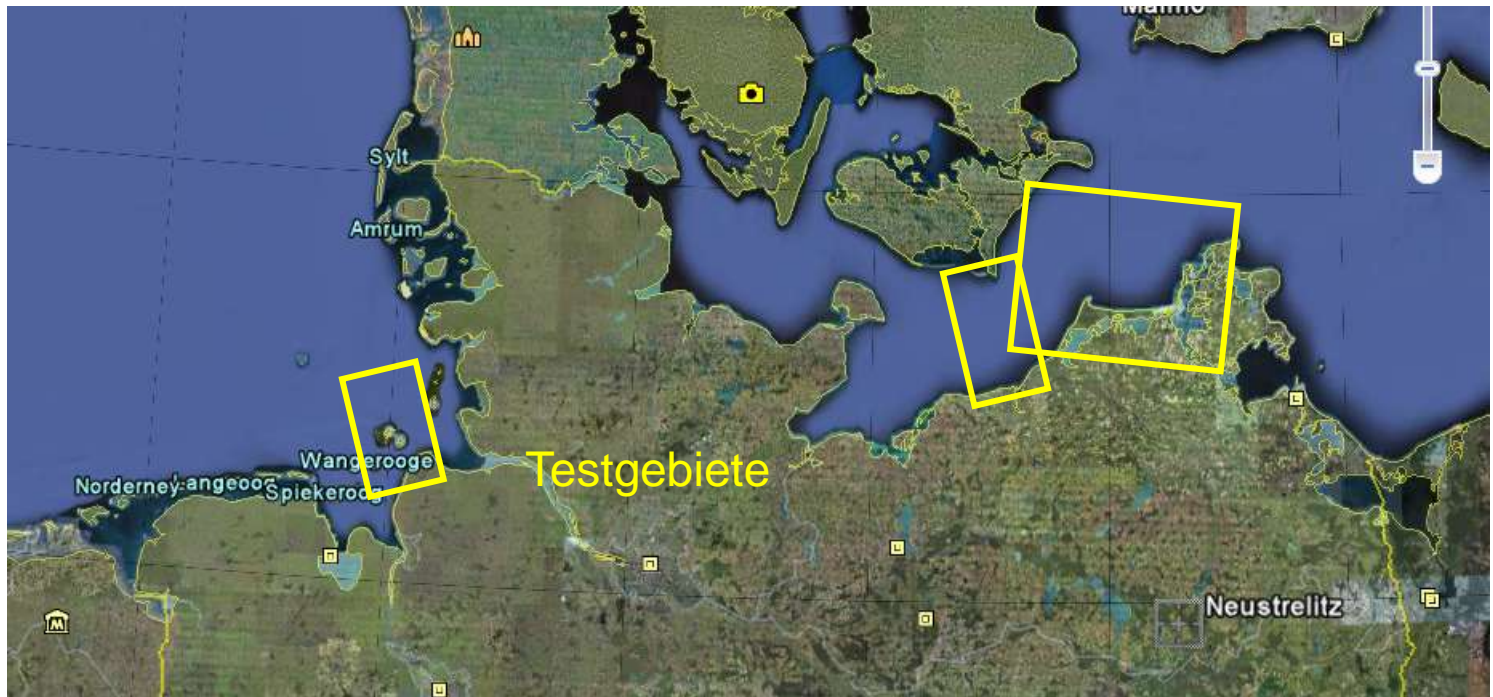


## Scenario

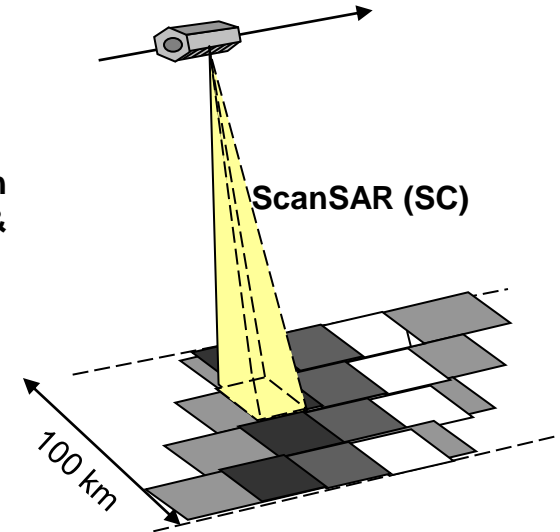
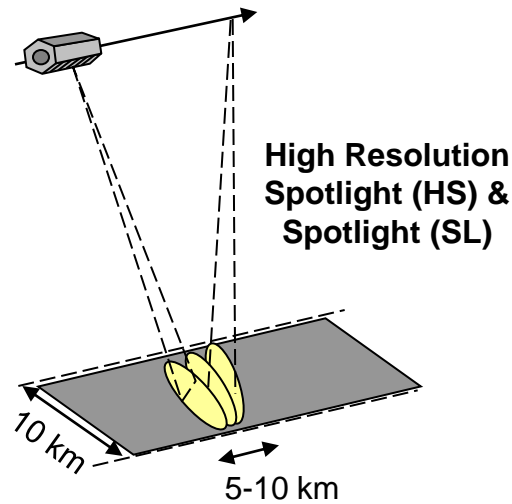
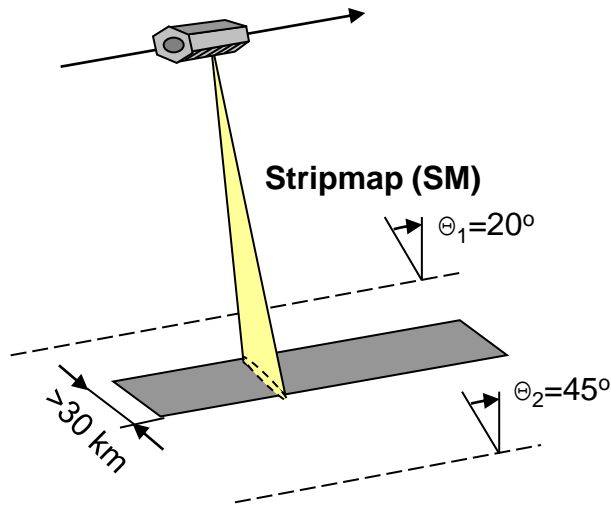


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Testergebnisse TerraSAR-X Februar 2010
- NRT Ship Detection Service  
Testergebnisse ERS-2 Tests Februar 2010

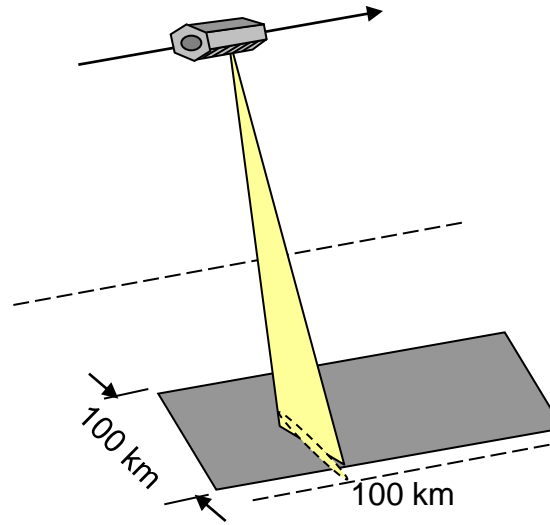


# Aufnahme Moden TerraSAR-X



	<b>Stripmap (SM)</b>	<b>Spotlight (HS and SL)</b>	<b>ScanSAR (SC)</b>
<i>swath width</i>	30 km (single pol.) 15 -30 km (dual pol.)	10 km, azimuth extend: 5 / 10 km (HS / SL)	100 km
<i>full performance incidence angle range</i>	20° - 45°	20° - 55°	20° - 45°
<i>azimuth resolution</i>	3 m (single pol.) 6 m (dual pol.)	1 m / 2 m (HS , single / dual pol.) 2 m / 4 m (SL , single / dual pol.)	17 m (1 look, 4 beams)
<i>ground range resolution @ 150 MHz chirp BW</i>	1.7 m - 3.5 m (@ 45°.. 20°)	1.5 m - 3.5 m (@ 55°..20°)	1.7 m - 3.5 m (@ 45°.. 20°)

# Aufnahme Mode ERS-2



<i>swath width</i>	100 km (single pol.)
<i>single frame length</i>	ca. 100 km (single pol.)
<i>ground resolution</i>	30 m (single pol.)

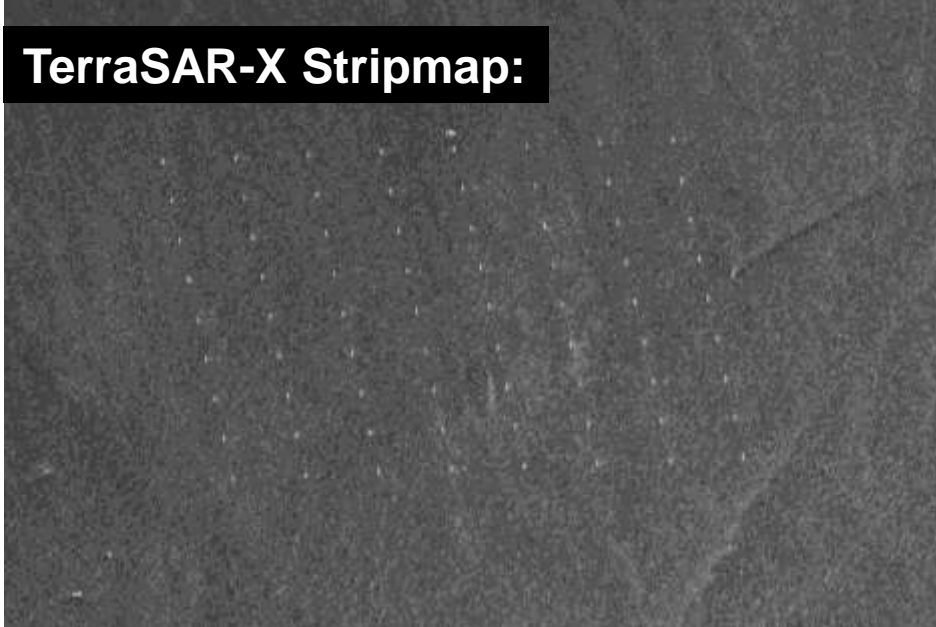




# Stripmap: Windfarm Nysted



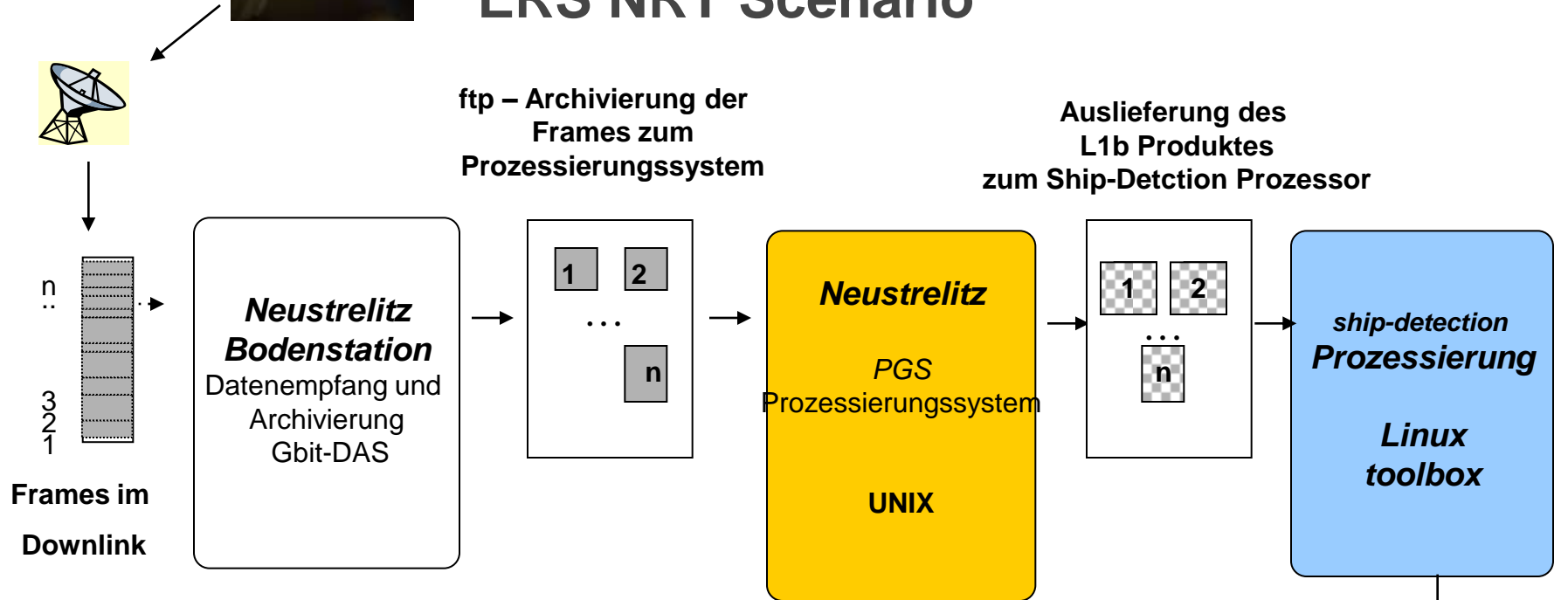
**TerraSAR-X Stripmap:**



**ERS 2:**

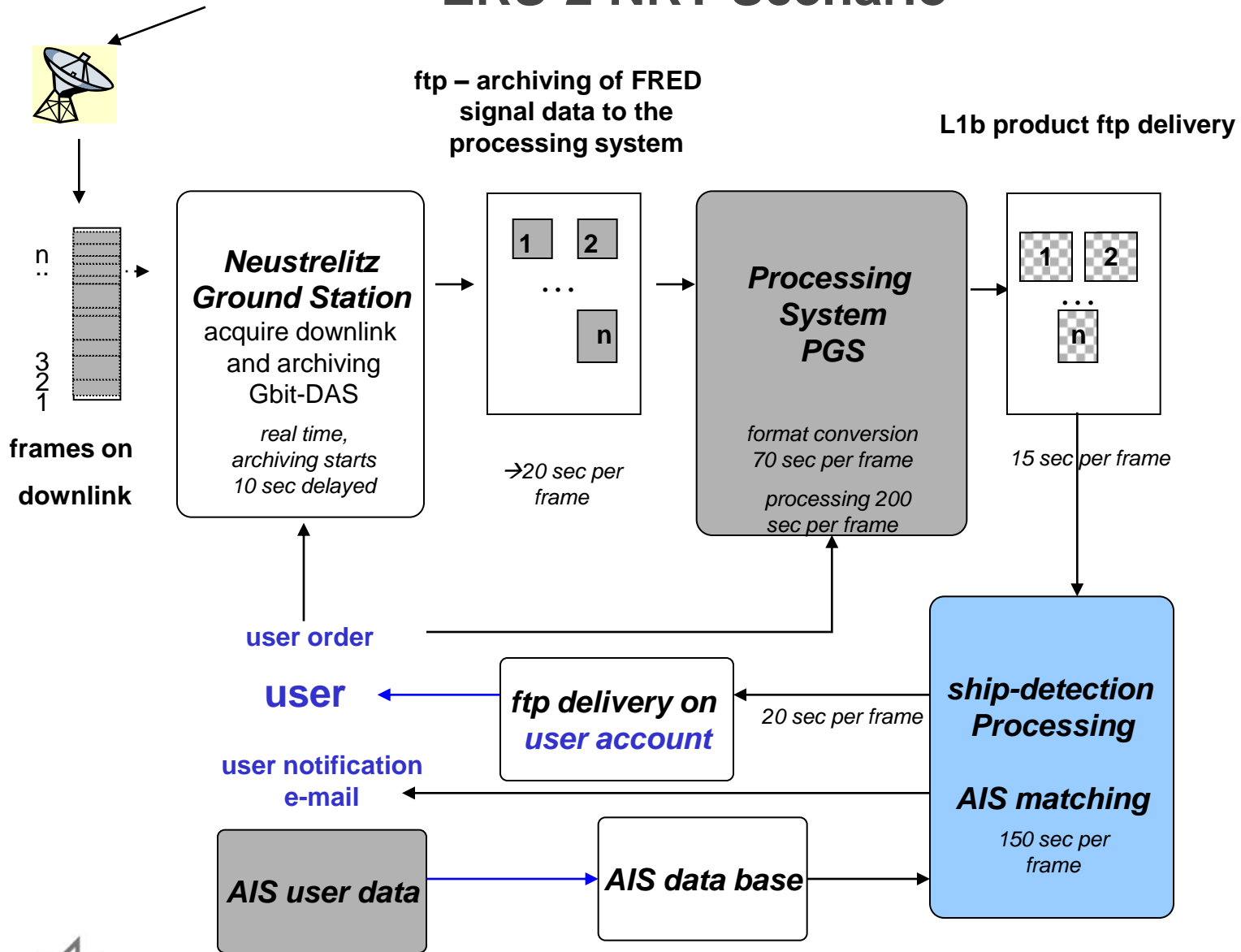


# ERS NRT Scenario



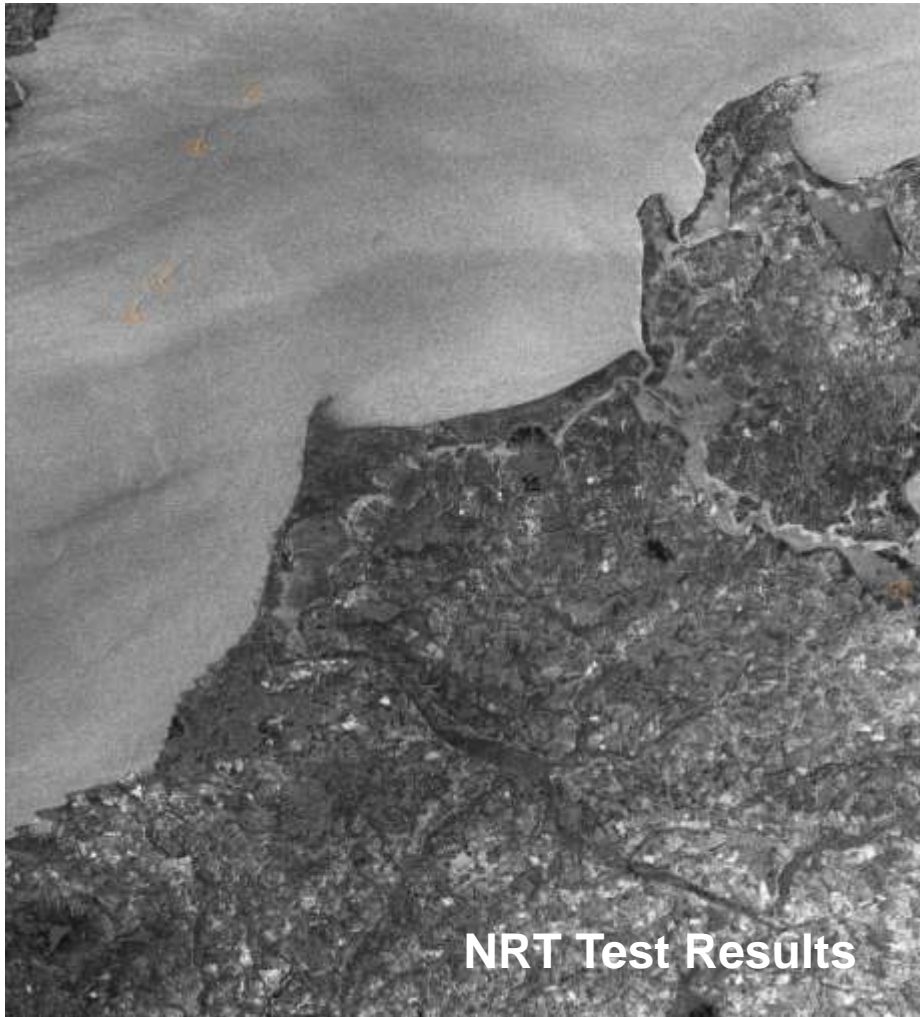
- *Empfang und Prozessierung von Einzel – oder verbundenen Szenen ; Empfangssystem MDA Direkt Archiv System*
- *Archivierung mit ca. 10 sec. Versatz zum PGS Prozessierungssystem*
- *Formatkovertierung und Prozessierung (2 Szenen parallel), Transfer zum Ship Detection Prozessor*
- *Ship Detection Prozessierung*
- *Produktauslieferung*
- *E-Mail über Produktbereitstellung an Nutzer innerhalb 12-15 min*

# ERS-2 NRT Scenario



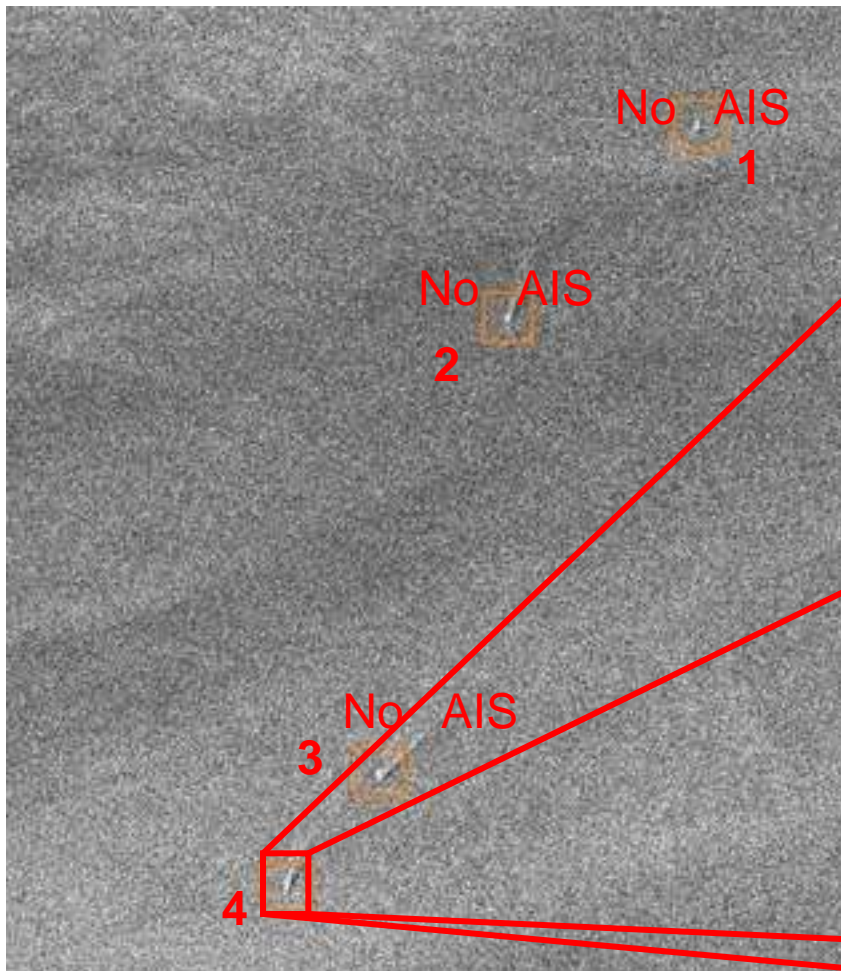


ERS2\_20100302100924





# ERS2\_20100302100924



266247000 

**266247000**

messageType: 1  
repeatIndicator: 0  
mmsi: 266247000  
navigationStatus: 0  
rateOfTurn: 0  
speedOverGround: 177  
positionAccuracy: 1  
longitude: 7353828  
latitude: 32763121  
courseOverGround: 2119  
trueHeading: 210  
timeStamp: 19  
maneuverIndicator: 0  
spare: 0  
raimFlag: 0  
radioStatus: 66314  
time: Tue Mar 02 10:09:19 UTC 2010  
timeDifference: -4 s

Route: [Nach hier](#) - [Von hier](#)



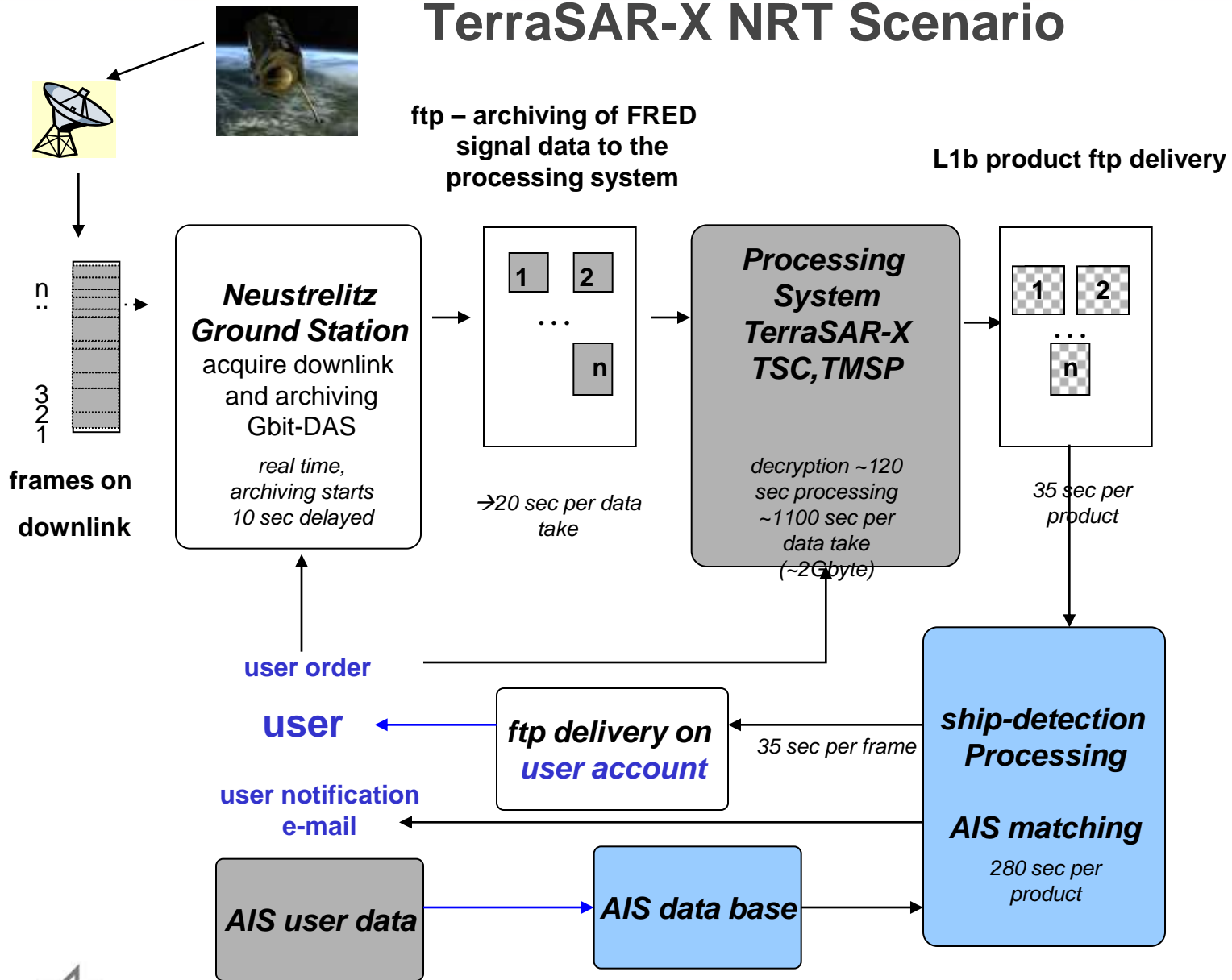


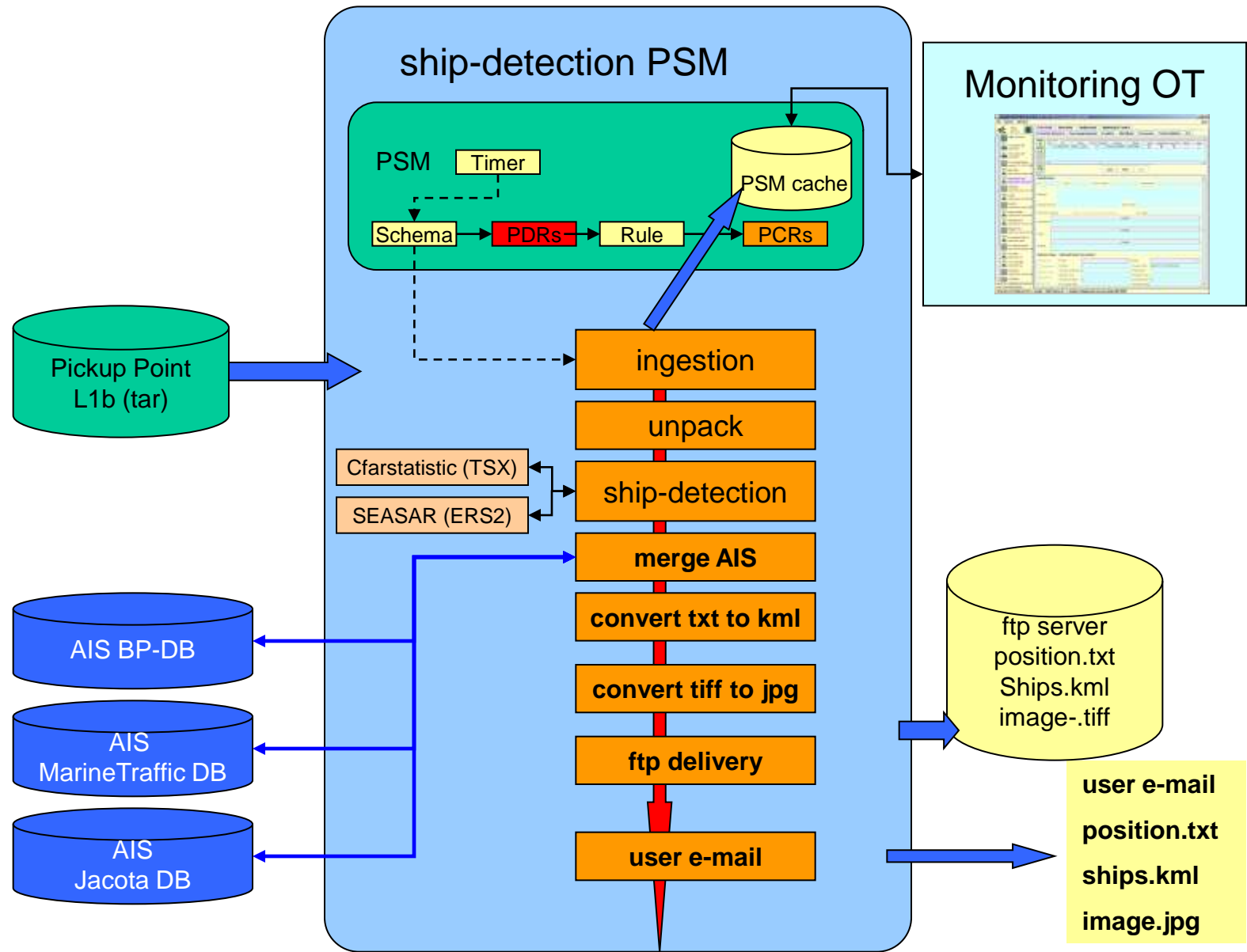
# ERS Processing Time

- Acquisition ERS2\_20100302100924
- 20100302T100932 end of archiving
- 20100302T100934 start format converting and L1b processing
- 20100302T101617 ship-detection starts ingesting file  
ER02\_SAR\_IMP\_1P\_20100302T100916\_20100302T100932xxx.tar
- 20100302T102034 leaving ftp upload ship-detection product to ftp server
- 20100302T102100 e-mail delivery to user
  
- **total time from taking image to user delivery ~ 12 min**



# TerraSAR-X NRT Scenario



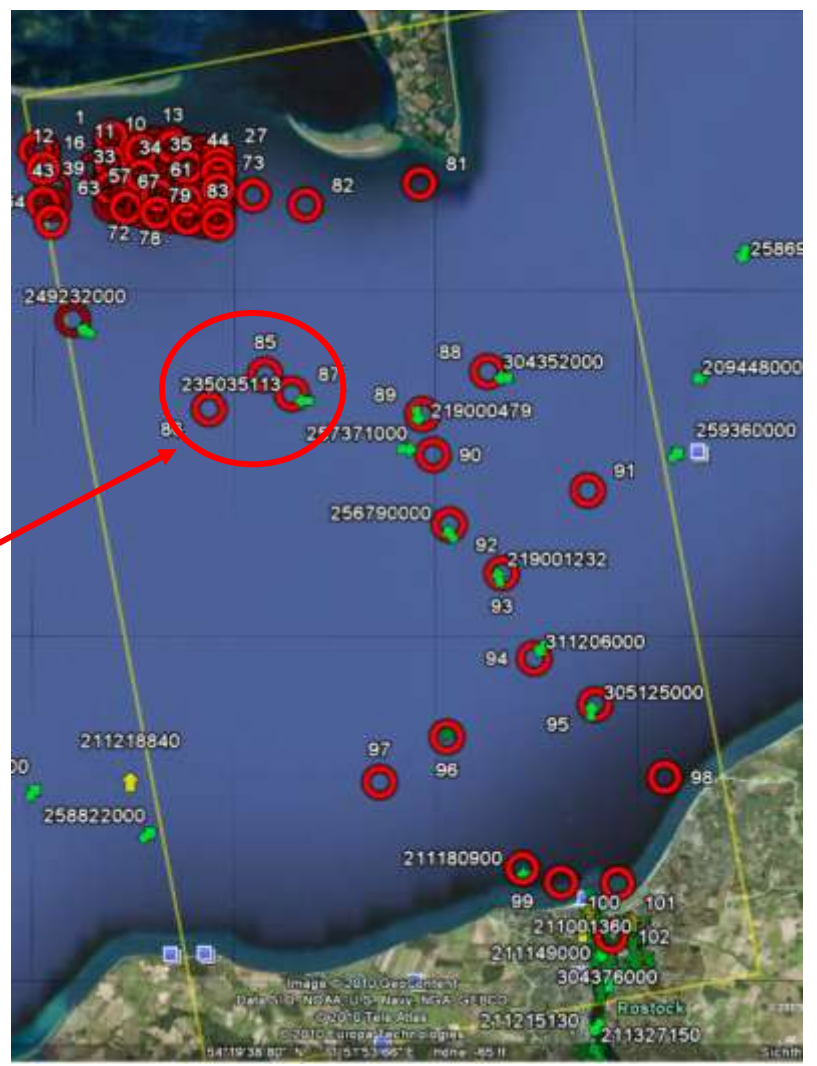


## TSX1\_SAR\_MGD\_SE\_\_SM\_S\_SRA\_20100205T164424\_20100205T164431

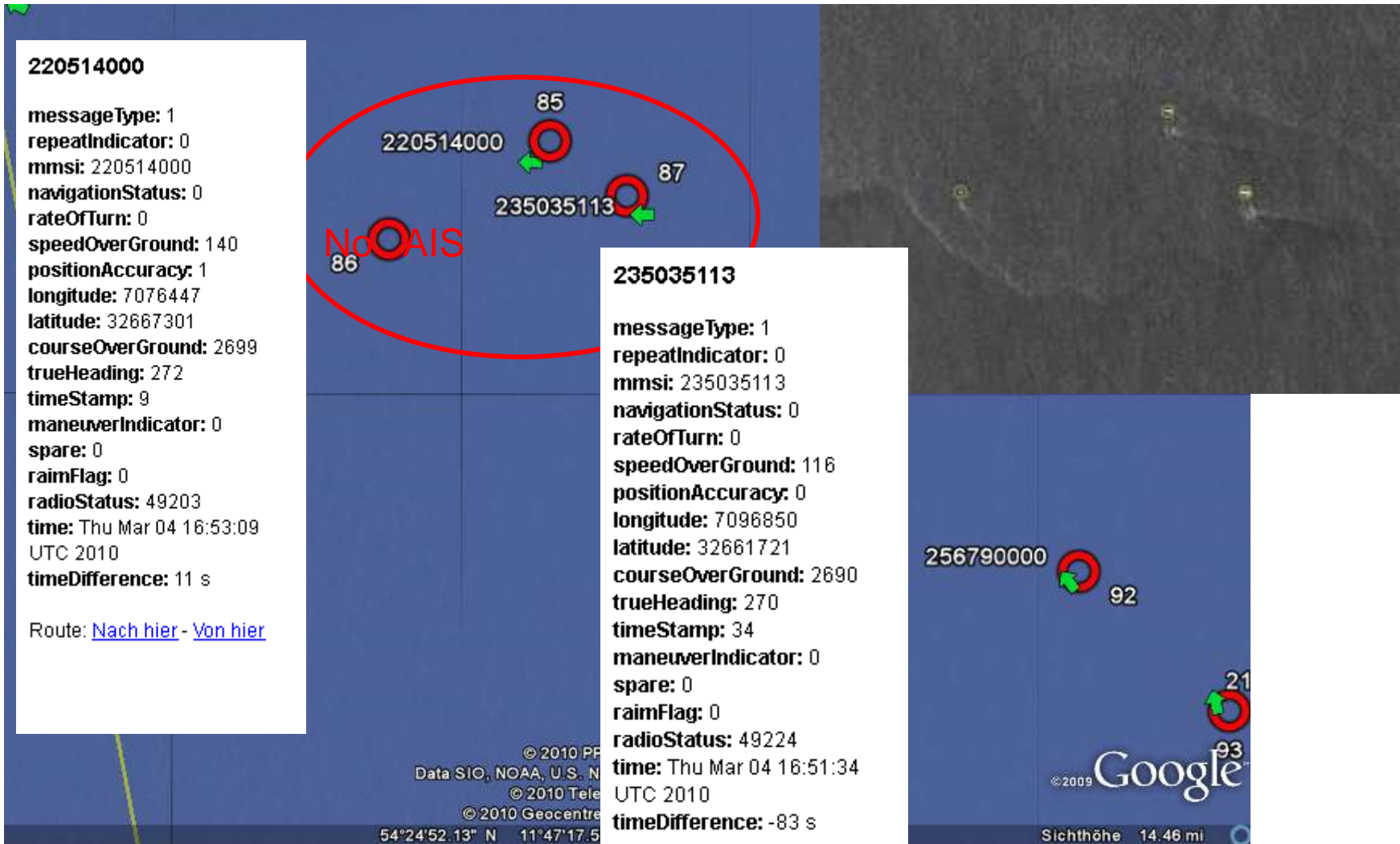
### Processing Times

- **Downlink Neustrelitz 16:39 – 16:48 UTC**
- **TSC (decryption) 2010-02-05T16:51:05** | Success | processor | processor DAS-Lookup (0): new product DT.RAW.STD-TSX1-DT12604-RP00030229 at /TSXB02/in
- **TSC teg/pp-das-tsc/TSX1\_SAR\_\_RAW\_ISP\_\_NSG\_RP00030229\_SRA\_0\_DT12604\_C\_ENC\_NRT.10012**
- **2010-02-05T16:52:53** | Success | processor | processor TTP-TMSP-Transfer PcR 253546697 (0): exec: /TSXB02/integ/tsc/cfg/processors /transfer.pl -in0=/TSXB02/integ/tsc/runtime/cache/decrypted/DEC-TSX1DT12604
- **TMSP (L1bprocessing) 2010-02-05T16:53:36** | Info | rule | PdR 339687326 RAW Product 339687329 added
- **TMSP 2010-02-05T17:11:37** | Success | rule | TsxL1bFutureNrtRule: PdR 339687326 (TsxL1bFutureNrt): PcR 339687327 (tsx-l1b-future-nrt): AD Delivery Rule:
- **TMSP 2010-02-05T17:15:19** | Info | rule | PdR 339687326: Delivered to ftp://genesi-develop.nz.dlr.de//home/tsxoper/shiptest/TerraSar (package-id = dims\_op\_oc\_dfd2\_204694742) | volumes=1 size=2021603797 [volume=tsxoper@genesi-develop.nz.dlr.de/home/tsxoper/shiptest/TerraSar//dims\\_op\\_oc\\_dfd2\\_204694742\\_1.tar](ftp://genesi-develop.nz.dlr.de/home/tsxoper/shiptest/TerraSar//dims_op_oc_dfd2_204694742_1.tar)
- **Ship-Detect 2010-02-05T17:13:58.526** | success | kernel | Tsstion | PdR 318615463 of type TSX\_SD\_MergeAis added
- **Mail 2010-02-05T17:20:00** Dear all,Product TSX1\_SAR\_\_MGD\_SE\_\_SM\_S\_SRA\_20100205T164424\_20100205T164431 ready for download Server: ftpnz.caf.dlr.de
- **total time from taking image to user delivery ~ 32 min**
- **Complete user AIS coverage available for this area**

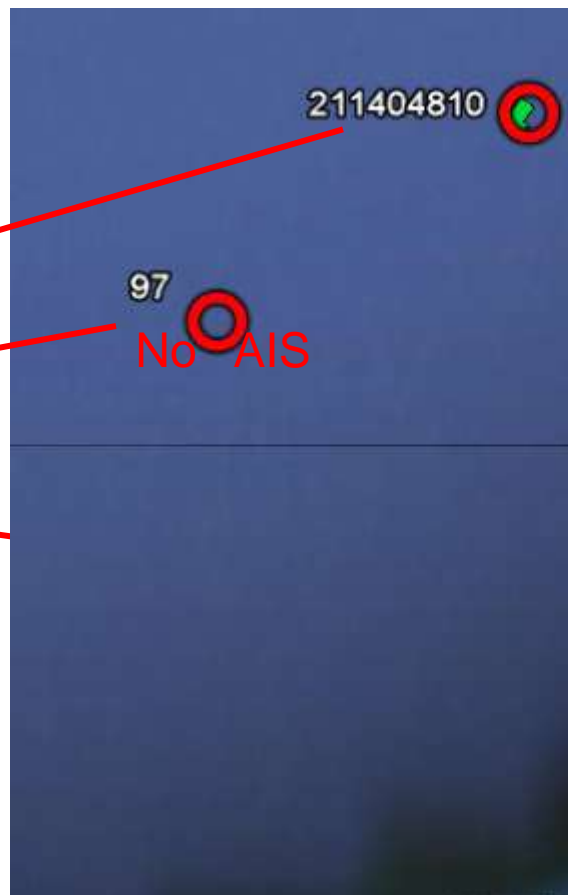




# TSX1\_SAR\_MGD\_SE\_\_SM\_S\_SRA\_20100304T165258



TSX1\_SAR\_MGD\_SE\_SM\_S\_SRA\_20100304T165258



211404810

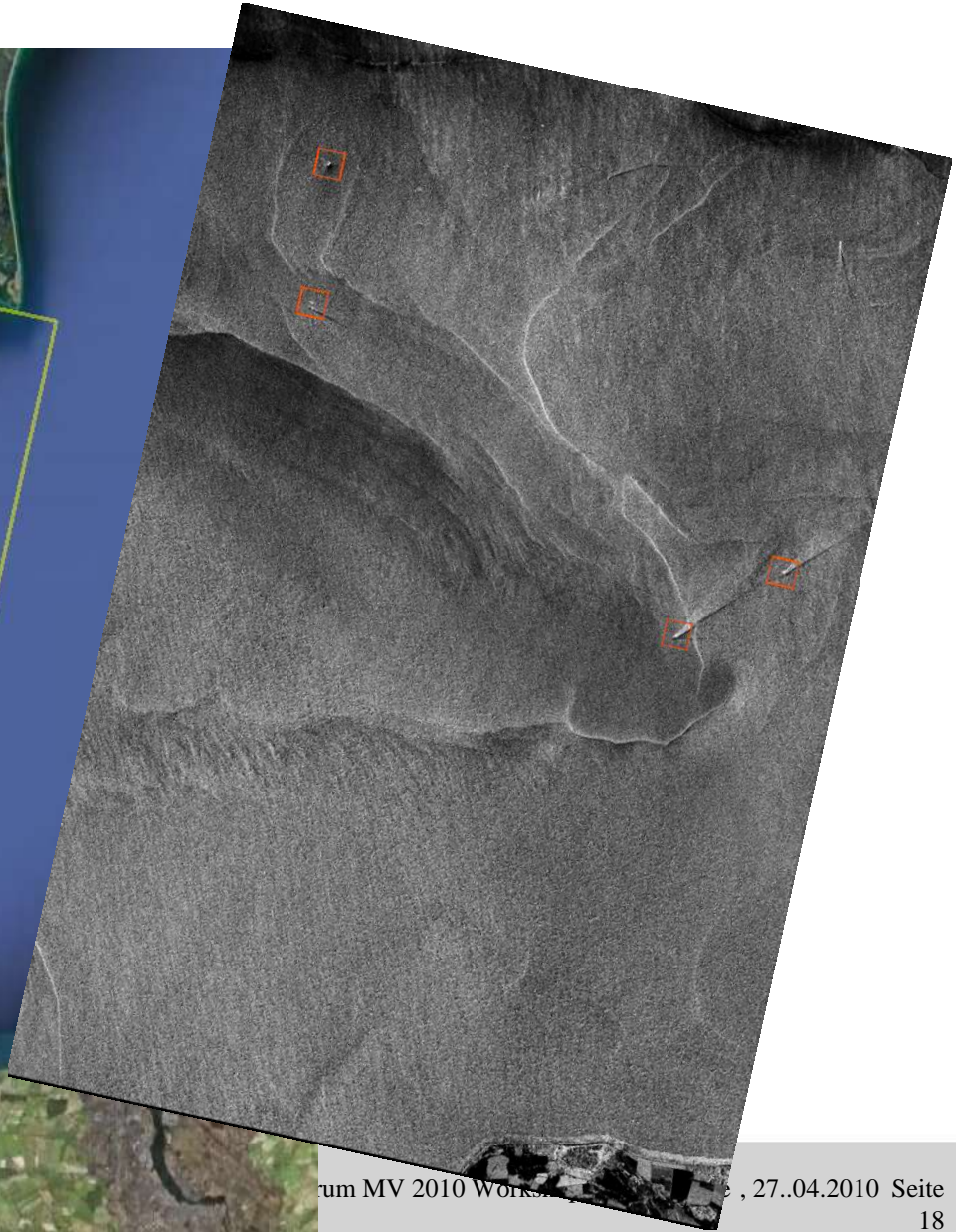
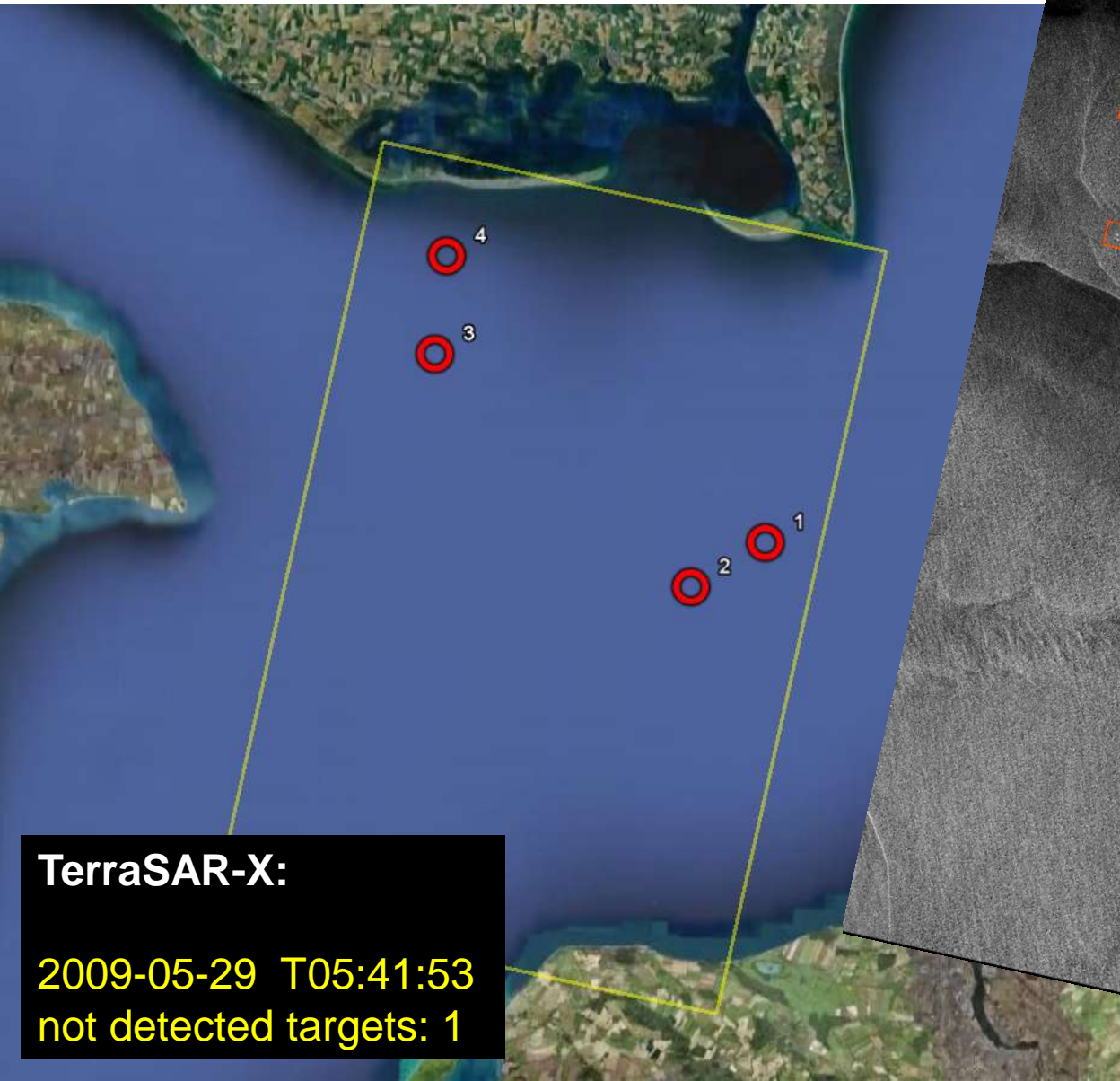
messageType: 1  
repeatIndicator: 0  
mmsi: 211404810  
navigationStatus: 0  
rateOfTurn: 0  
speedOverGround: 58  
positionAccuracy: 1  
longitude: 7175115  
latitude: 32557719  
courseOverGround: 2100  
trueHeading: 216  
timeStamp: 41  
maneuverIndicator: 0  
spare: 0  
raimFlag: 0  
radioStatus: 158868  
time: Thu Mar 04 16:52:41 UTC 2010  
timeDifference: -16 s  
additionalInformationsFromMessageType:  
5  
messageType: 5  
repeatIndicator: 0  
mmsi: 211404810  
aisVersion: 0  
imoNumber: 9252644  
callSign: DBGZ  
vesselName: ESCHWEGE  
shipType: 55  
dimToBow: 29  
dimToStern: 37  
dimToPort: 5  
dimToStarboard: 5  
positionFixType: 1  
etaMonth: 3  
etaDay: 8  
etaHour: 23  
etaMin: 0  
draught: 38  
dest: BALTIC SEA  
dte: 0

Route: [Nach hier](#) - [Von hier](#)





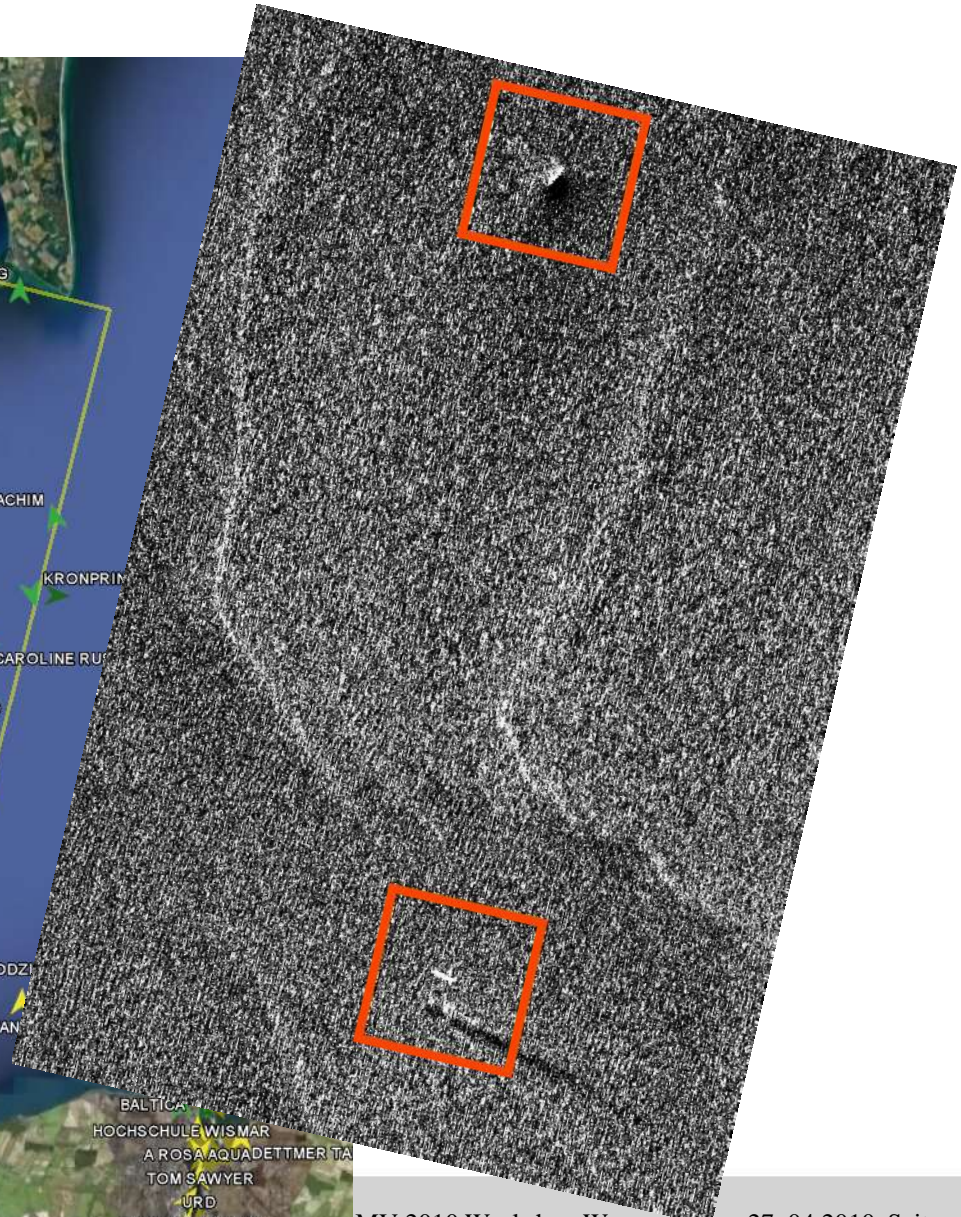
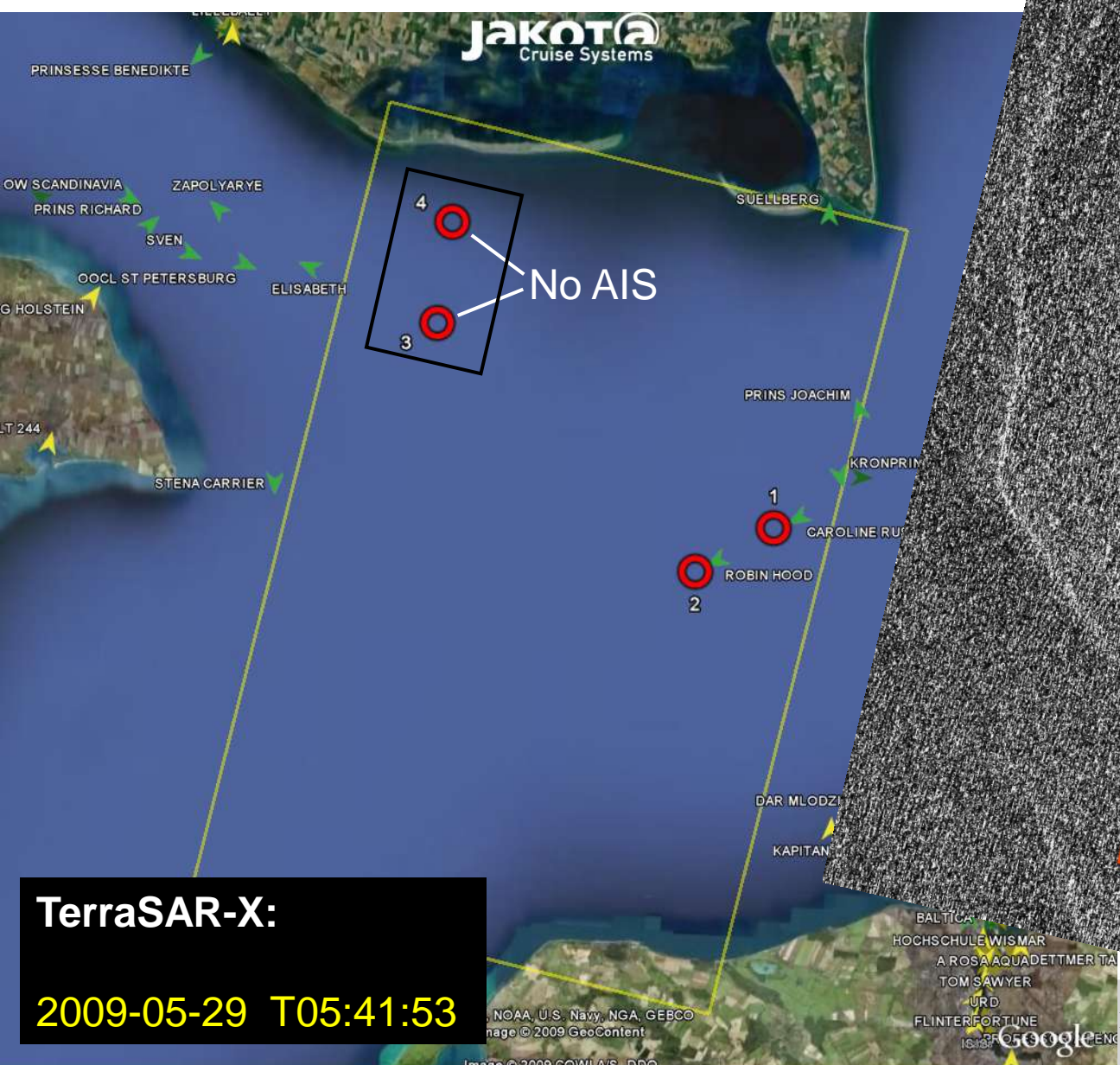
# Ship detection



**TerraSAR-X:**  
2009-05-29 T05:41:53  
not detected targets: 1



# Ship detection



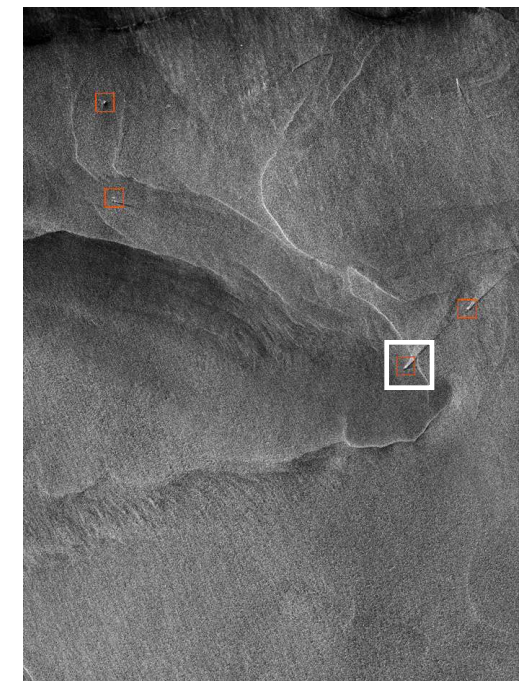
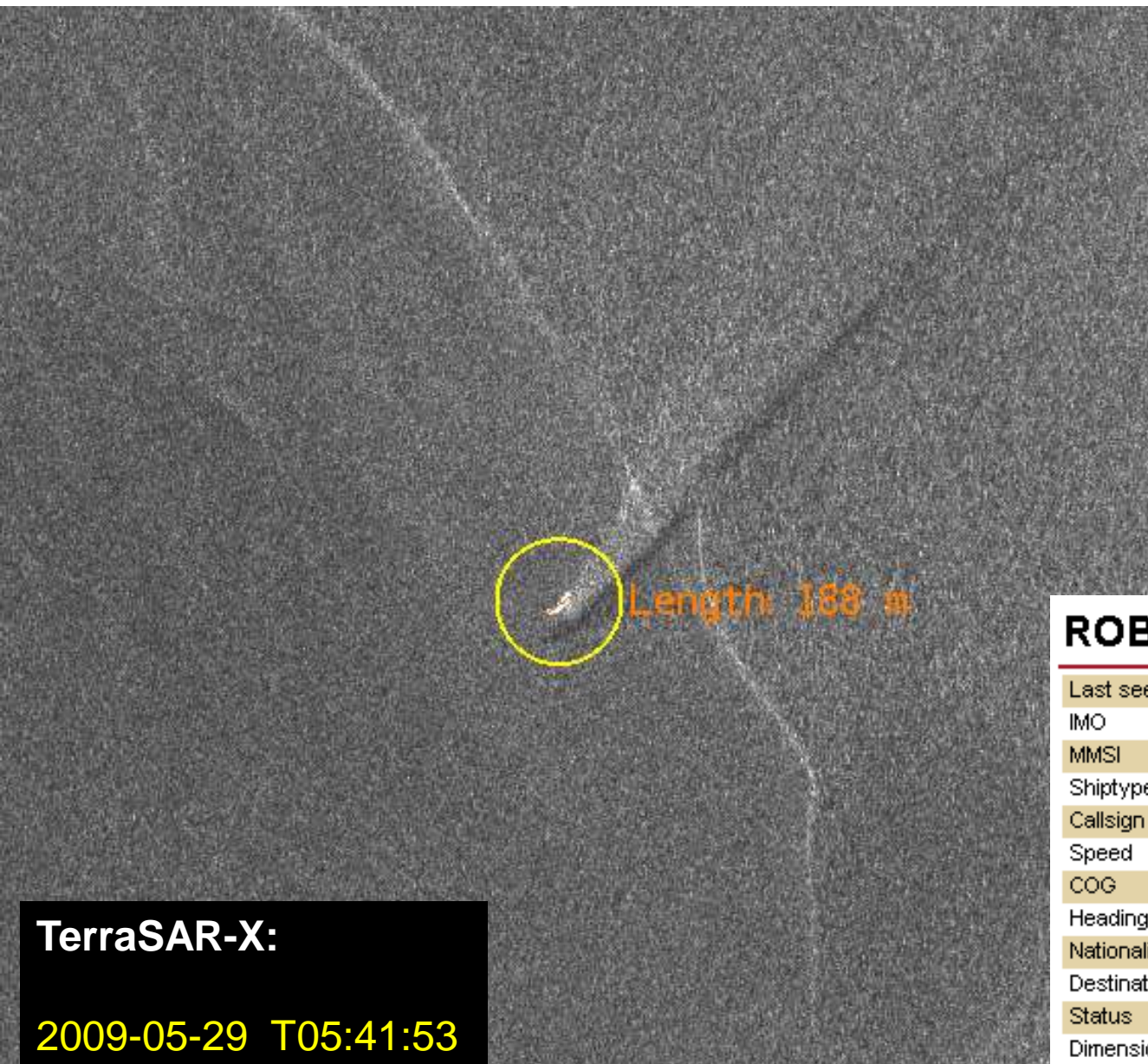
**TerraSAR-X:**  
2009-05-29 T05:41:53

NOAA, U.S. Navy, NGA, GEBCO  
Image © 2009 GeoContent

Google




# Ship detection



**TerraSAR-X:**  
2009-05-29 T05:41:53

## ROBIN HOOD

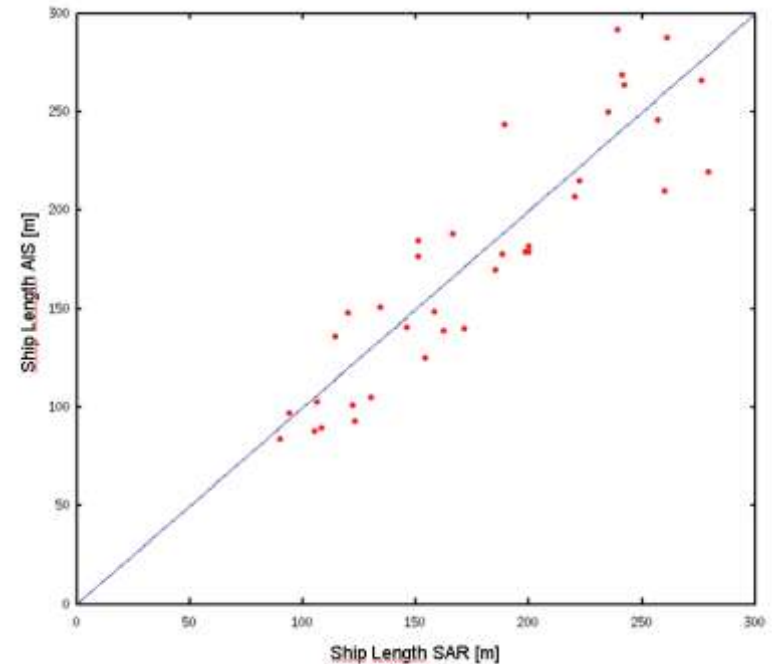
Last seen	2009-05-29 07:38:28
IMO	9087465
MMSI	211223970
Shiptype	passenger ship
Callsign	DGDM
Speed	12.8 km/h
COG	237°
Heading	240°
Nationality	 Germany
Destination	TRV TRE
Status	under way using engine
Dimensions	179m x 27m



# DLR Service Überblick - Ergebnisse

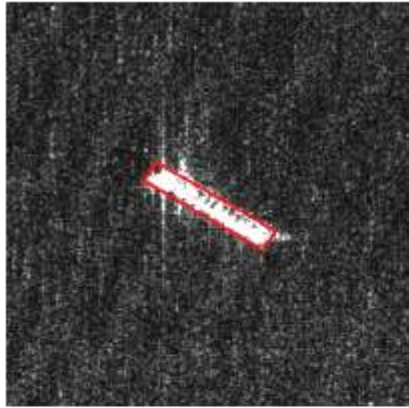
## AIS vs TerraSAR-X

- smallest detected ship: L 17m (AIS)
- length estimation accuracy : +/- 15m

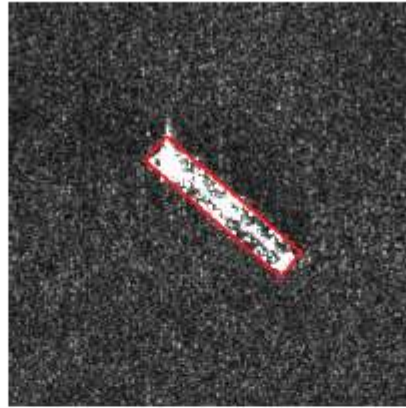


TerraSAR-X Mode	Azimuth Resolution	Ship Size	Sea State (SWH)	Wind Speed	Correlation Rate
Stripmap MGD	3.3m	15-25m	< 3m	up to 15 m/s	~48%
Stripmap MGD	3.3m	25-50m	< 3m	up to 15 m/s	~65%
Stripmap MGD	3.3m	50-100m	< 3m	up to 15 m/s	~82%
Stripmap MGD	3.3m	> 100m	< 3m	up to 15 m/s	~98%

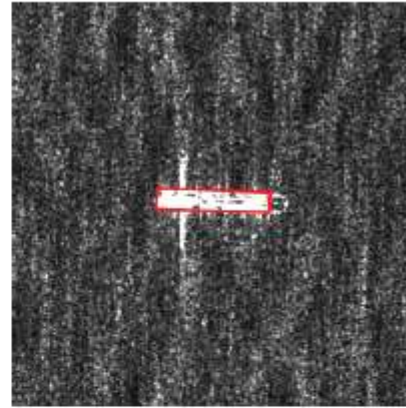
# Bestimmung der Schiffsgrösse



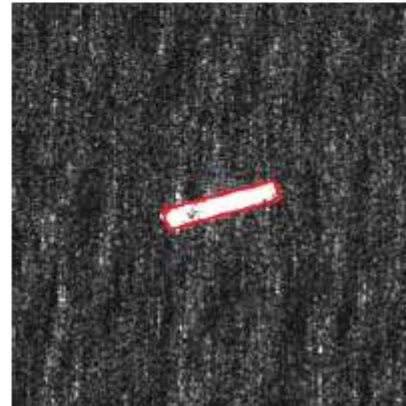
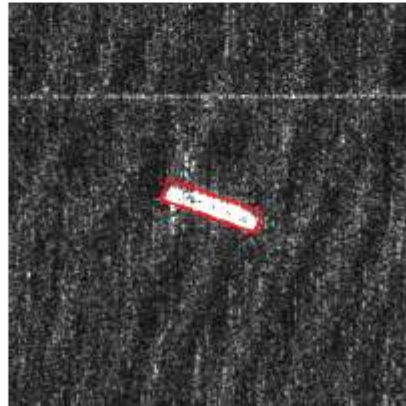
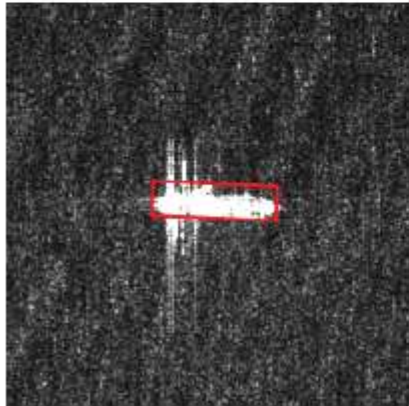
a



b



c



Position, Länge, Breite, Heading im Textfile