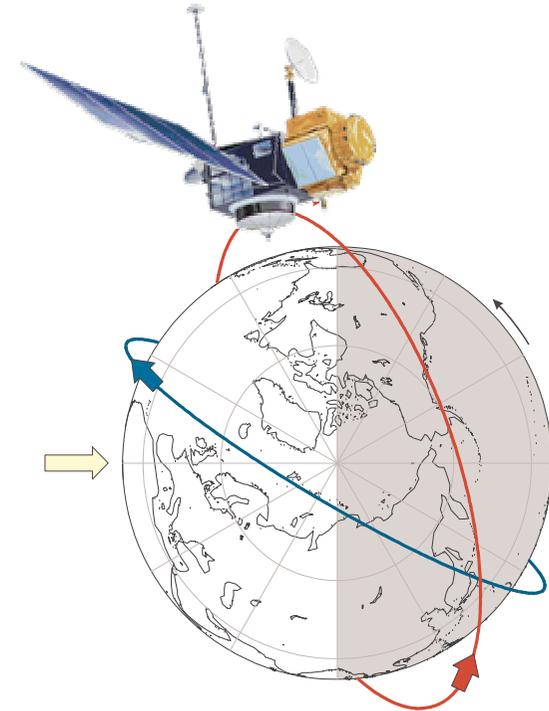


Analysis of DORIS residuals

From multiple satellites and POD centres



International Doris Service (IDS) Plenary Meeting, 3-4 May 2004, Paris, France

Eelco Doornbos and Pascal Willis (additional residual data contributed by John Ries, Michiel Otten, Phil Moore)

3 May 2004

1

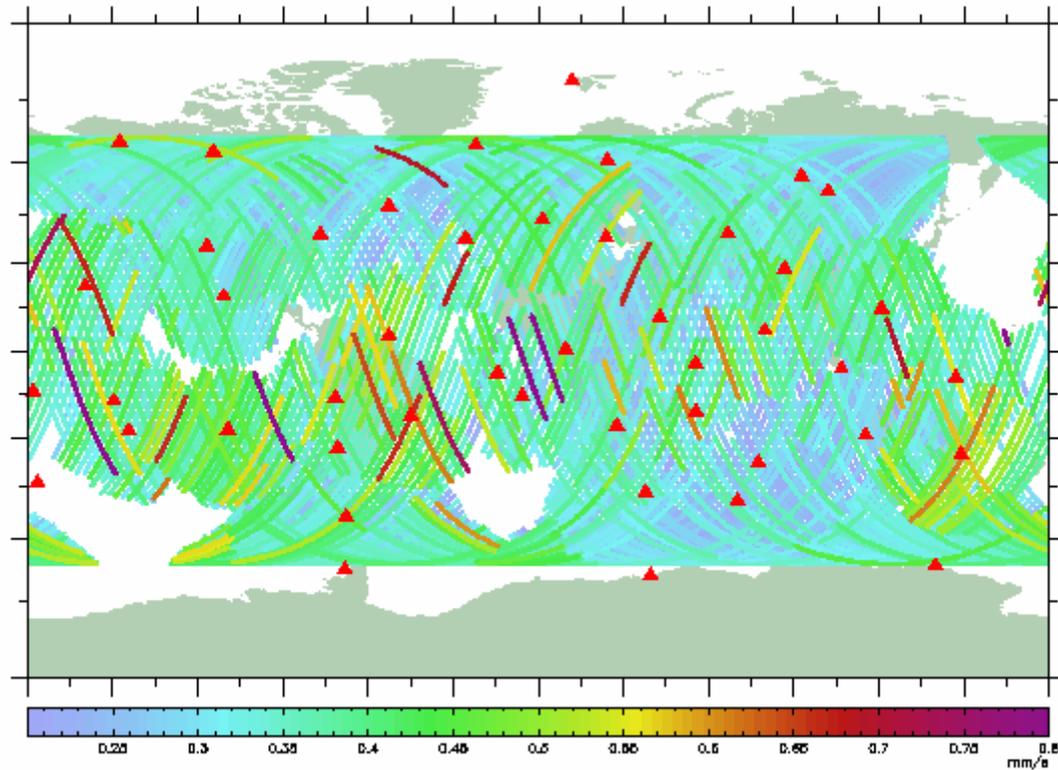
DORIS residuals from POD

- Difference: observed - computed DORIS range rates
- Indicates how well the computed orbits fit to the observation data
- Large residuals could be due to:
 - Orbit error
 - Error in the measurement data
 - Error in the media corrections
 - Error in the POD software measurement modelling
 - Software bug, coordinates, typos, ...

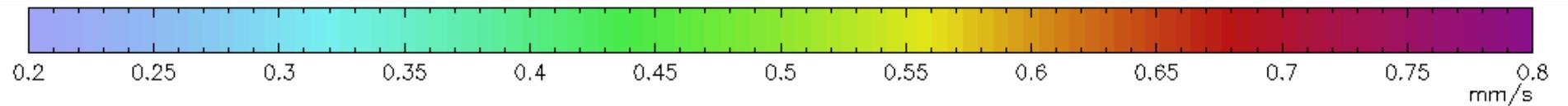
Jason-1 animation

DEOS

DORIS residuals for Jason-1 cycle: 1



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Residual data provided by:

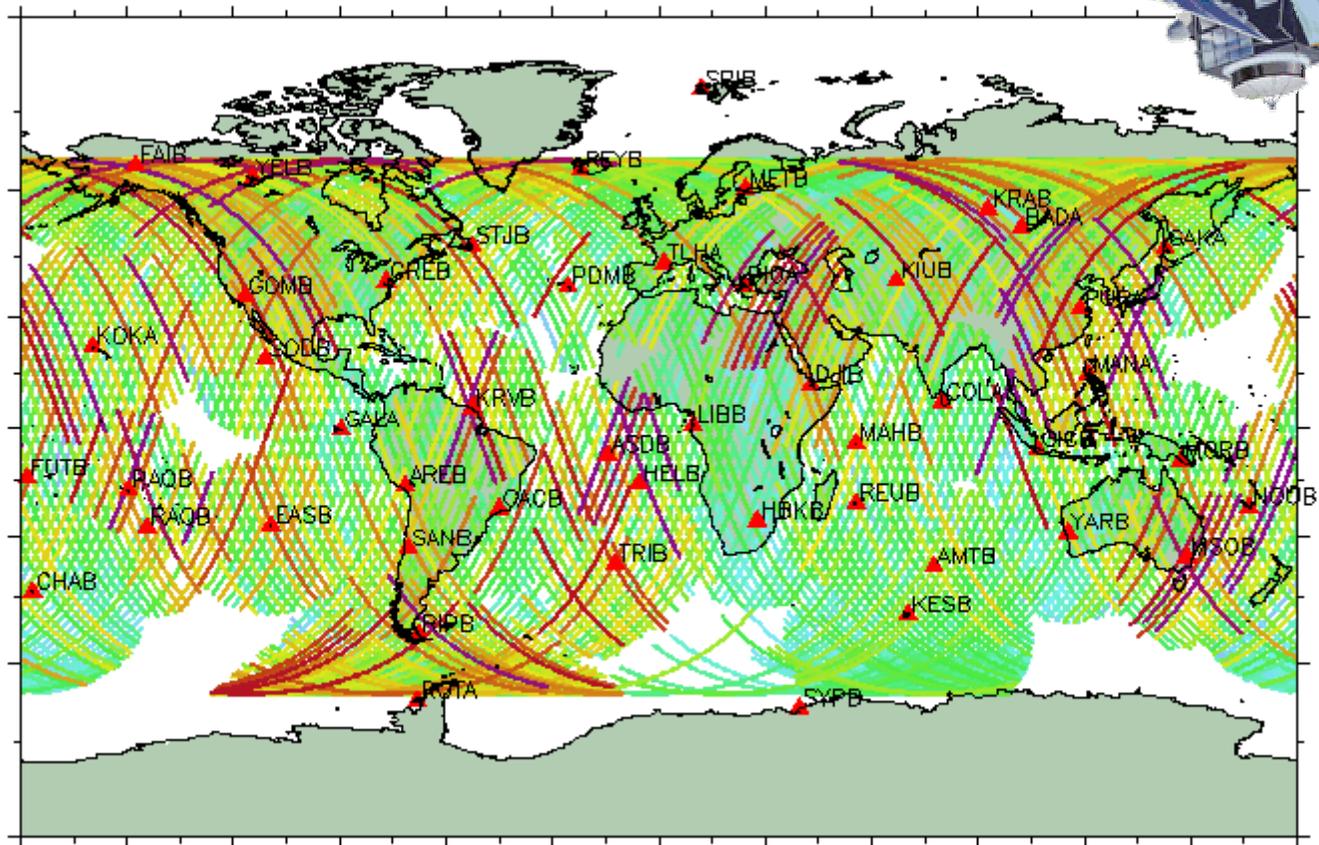
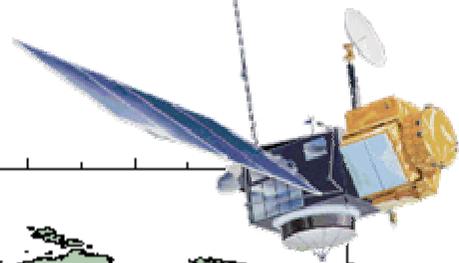
- Eelco Doornbos (TU Delft) : **T/P, Jason, Envisat**
- Phil Moore (Newcastle) : Envisat
- Michiel Otten (ESOC) : **Envisat**
- John Ries (CSR) : **T/P, Jason**
- Laurent Soudarin (CLS) : T/P, Jason, Envisat, SPOT
- Pascal Willis (JPL/IGN) : **T/P, Jason, Envisat, SPOT**

Geographic plotting of the residual data

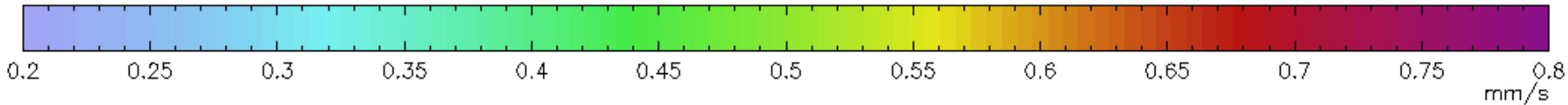
- Global: RMS residuals per pass
 - Identification of problems at specific stations, satellites or analysis centres
- Detailed: Per-measurement residuals
 - Identification of patterns, giving clues about potential error source

TOPEX/Poseidon cycle 360 (2002/06/22 – 2002/07/02)

DEOS

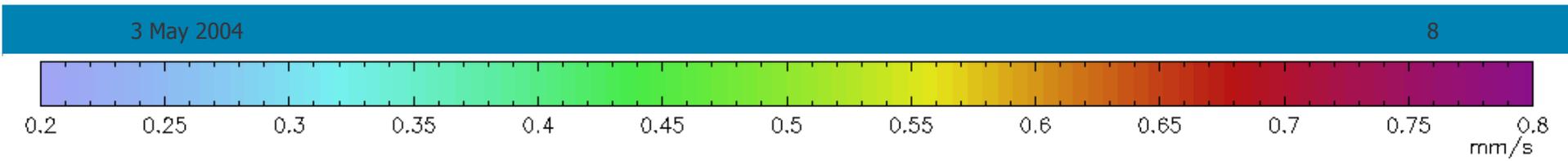
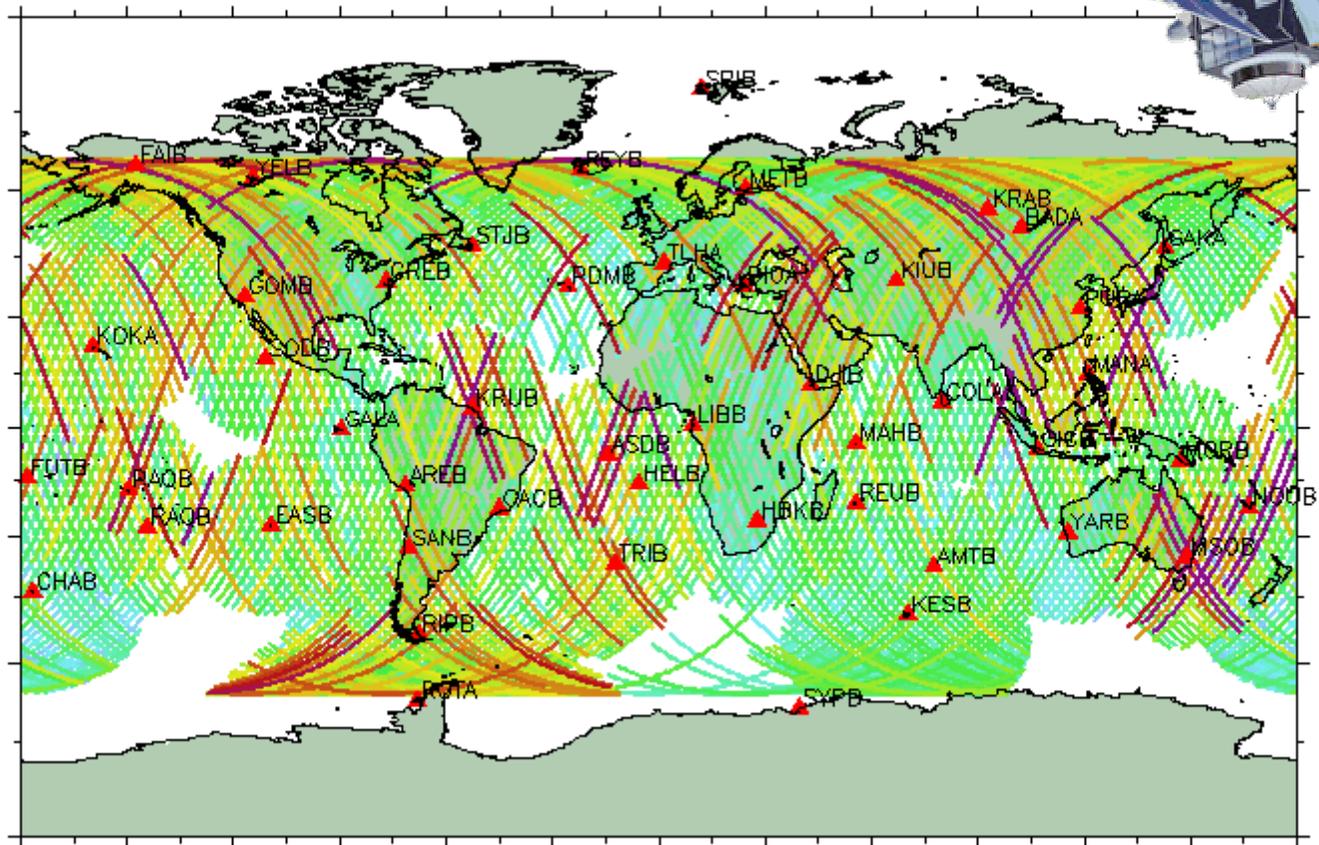
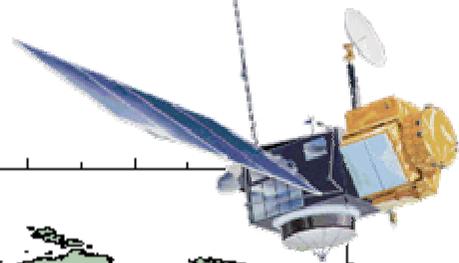


3 May 2004 7



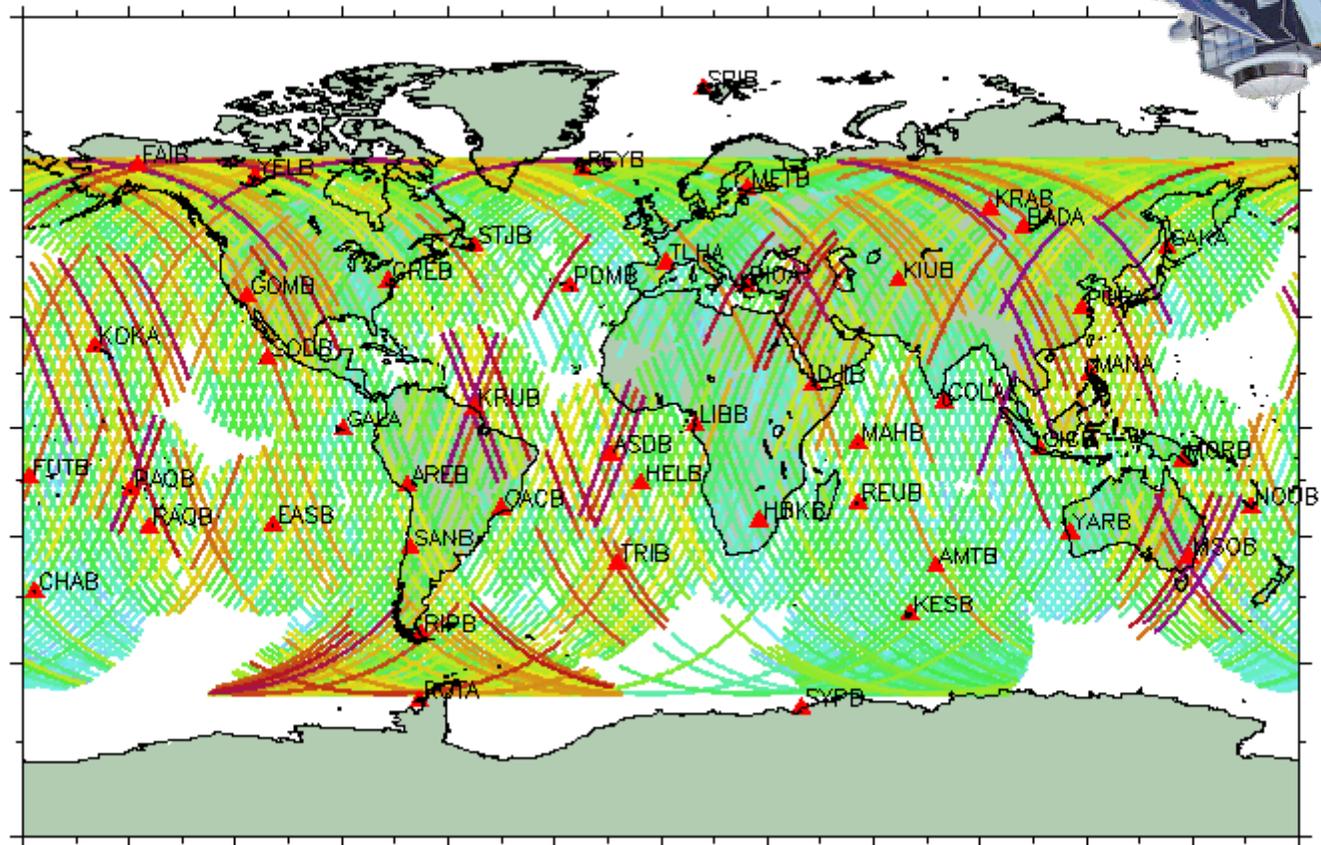
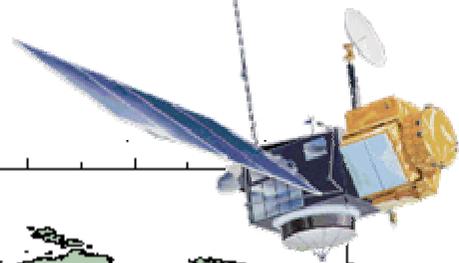
TOPEX/Poseidon cycle 360 (2002/06/22 – 2002/07/02)

IGN/JPL

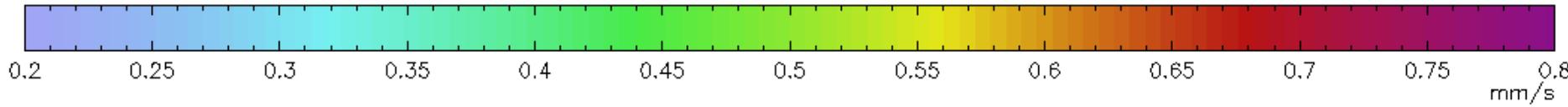


TOPEX/Poseidon cycle 360 (2002/06/22 – 2002/07/02)

CSR

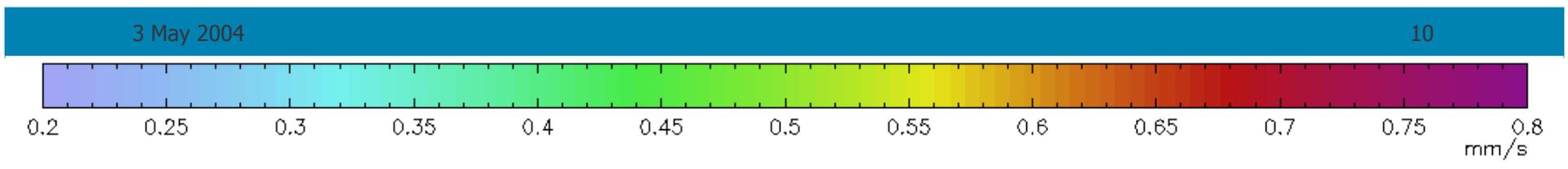
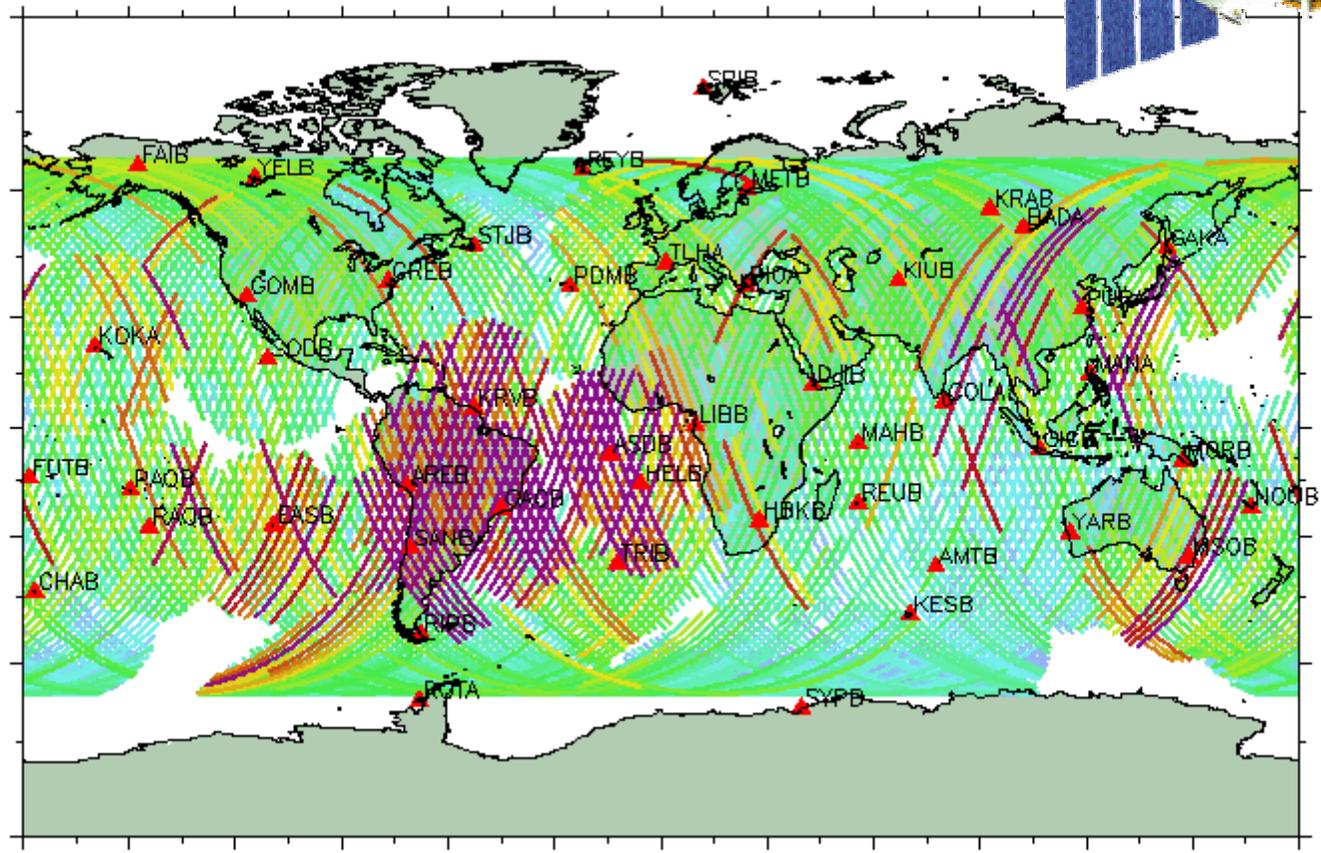
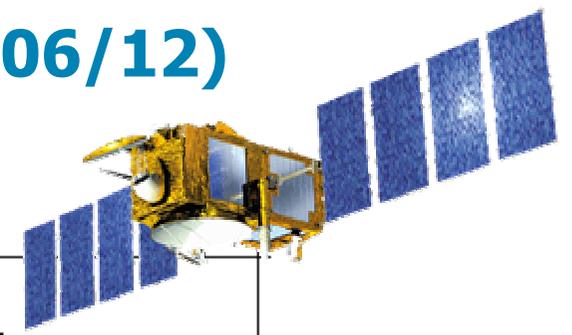


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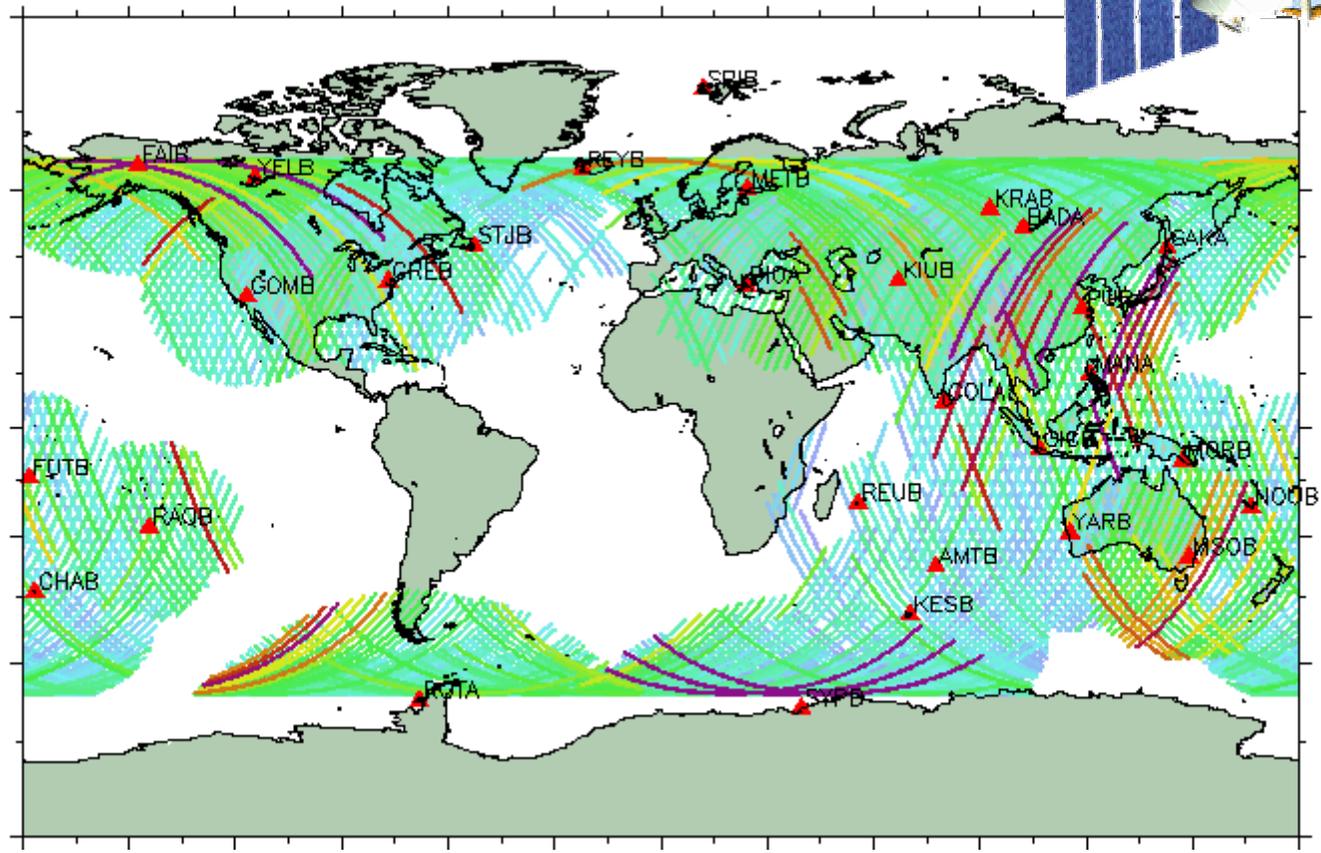
Jason-1 cycle 15 (2002/06/03 – 2002/06/12)

DEOS

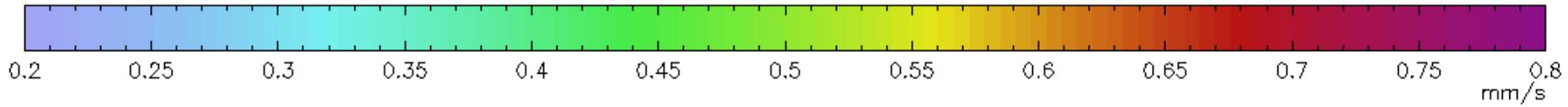


Jason-1 cycle 15 (2002/06/03 – 2002/06/12)

IGN/JPL

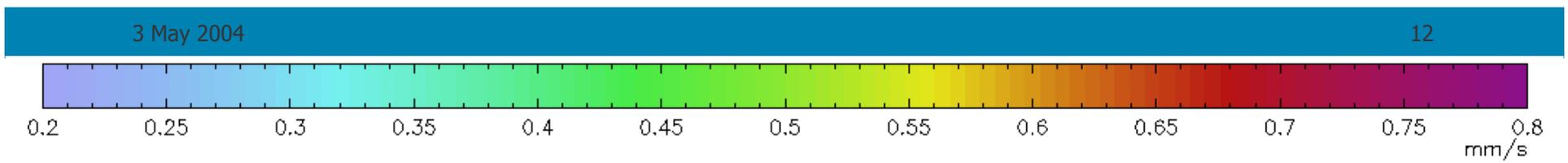
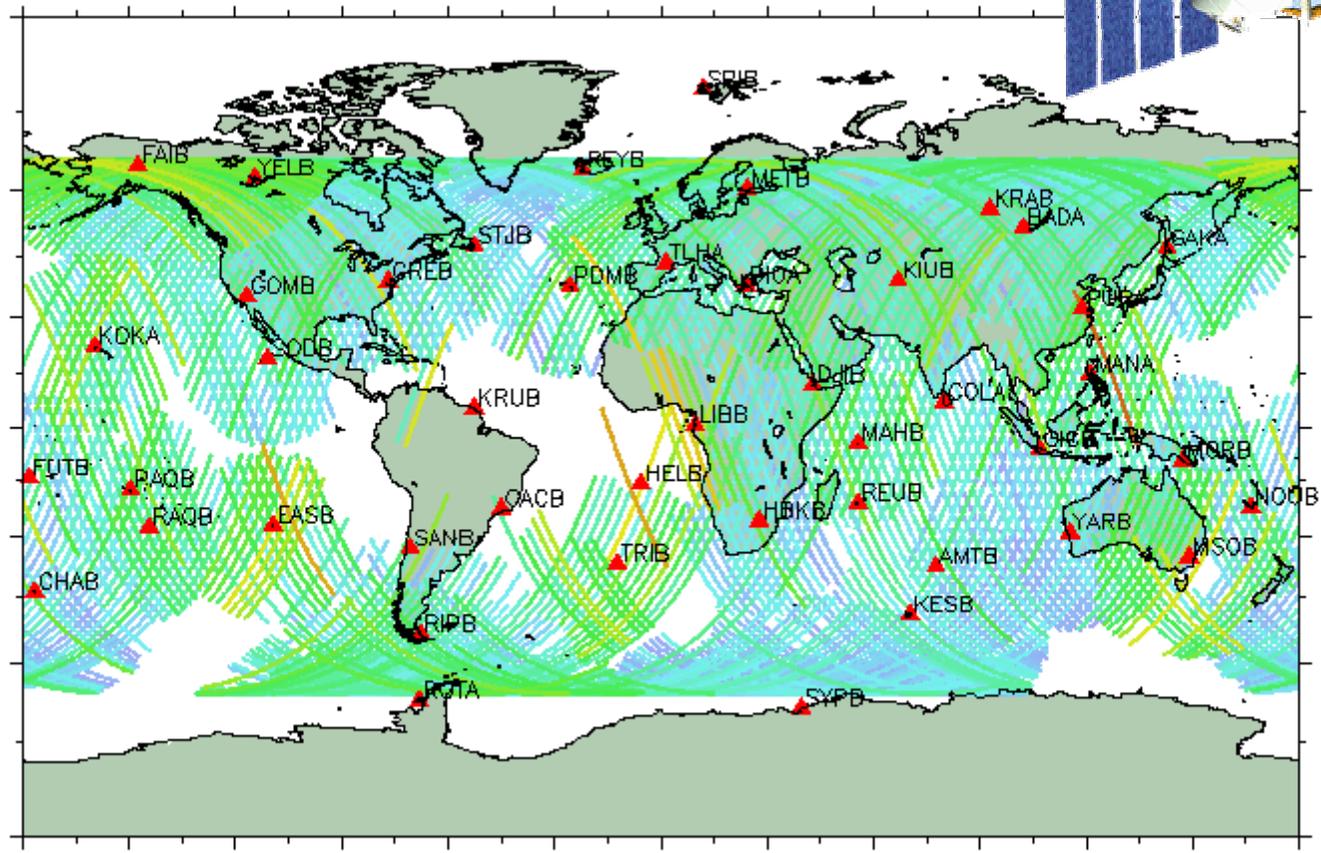


3 May 2004 11



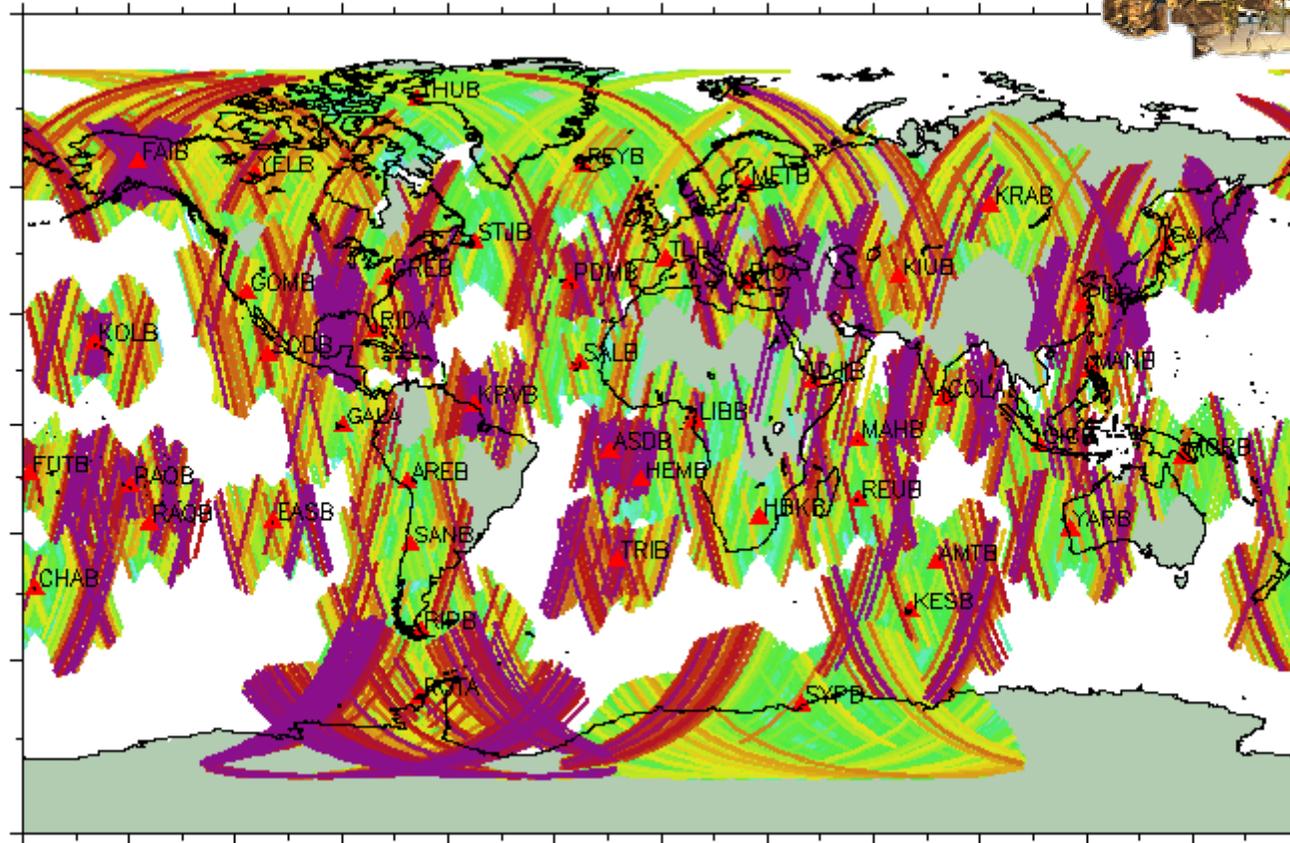
Jason-1 cycle 15 (2002/06/03 – 2002/06/12)

CSR

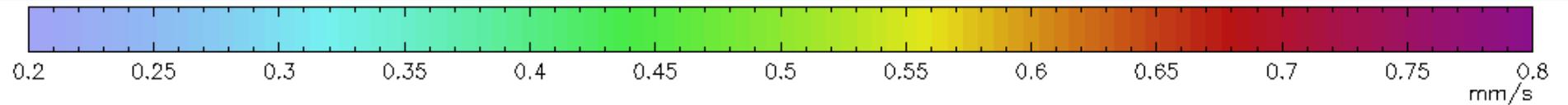


Envisat cycle 15 (2003/03/24 – 2003/04/28)

DEOS

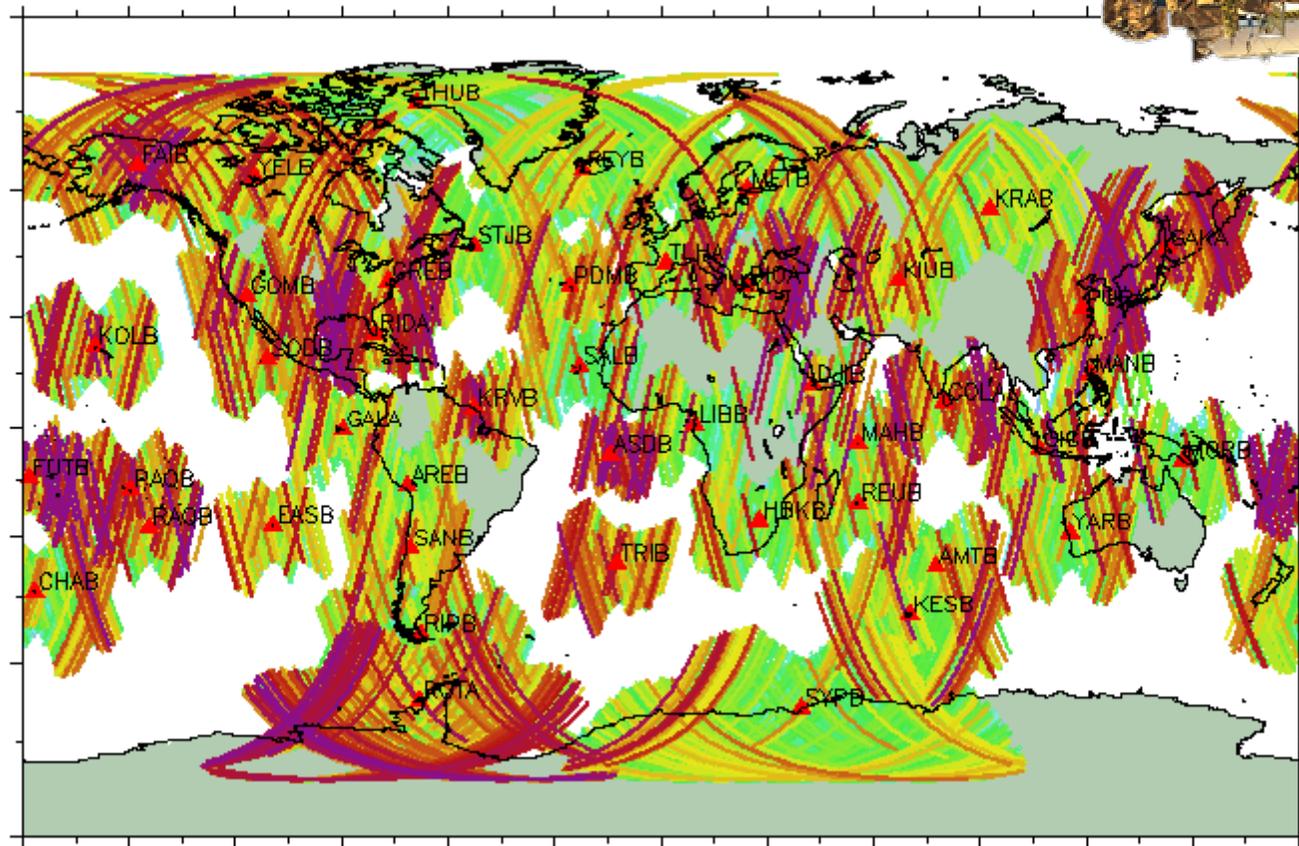
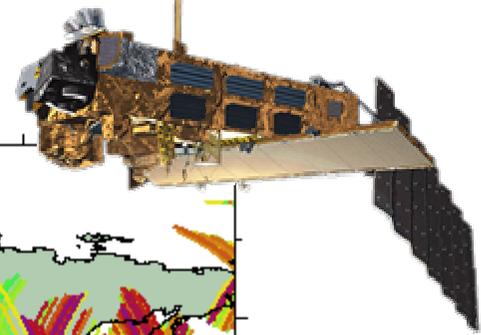


3 May 2004 13

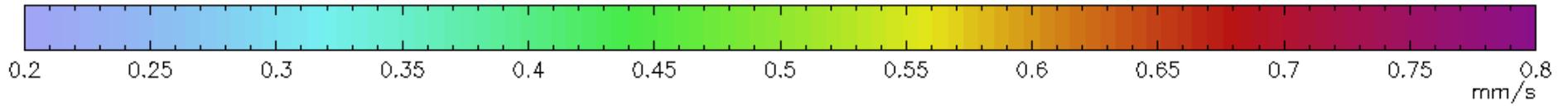


Envisat cycle 15 (2003/03/24 – 2003/04/28)

ESOC

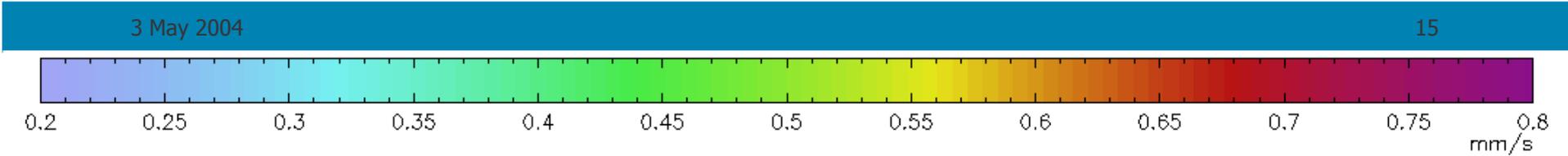
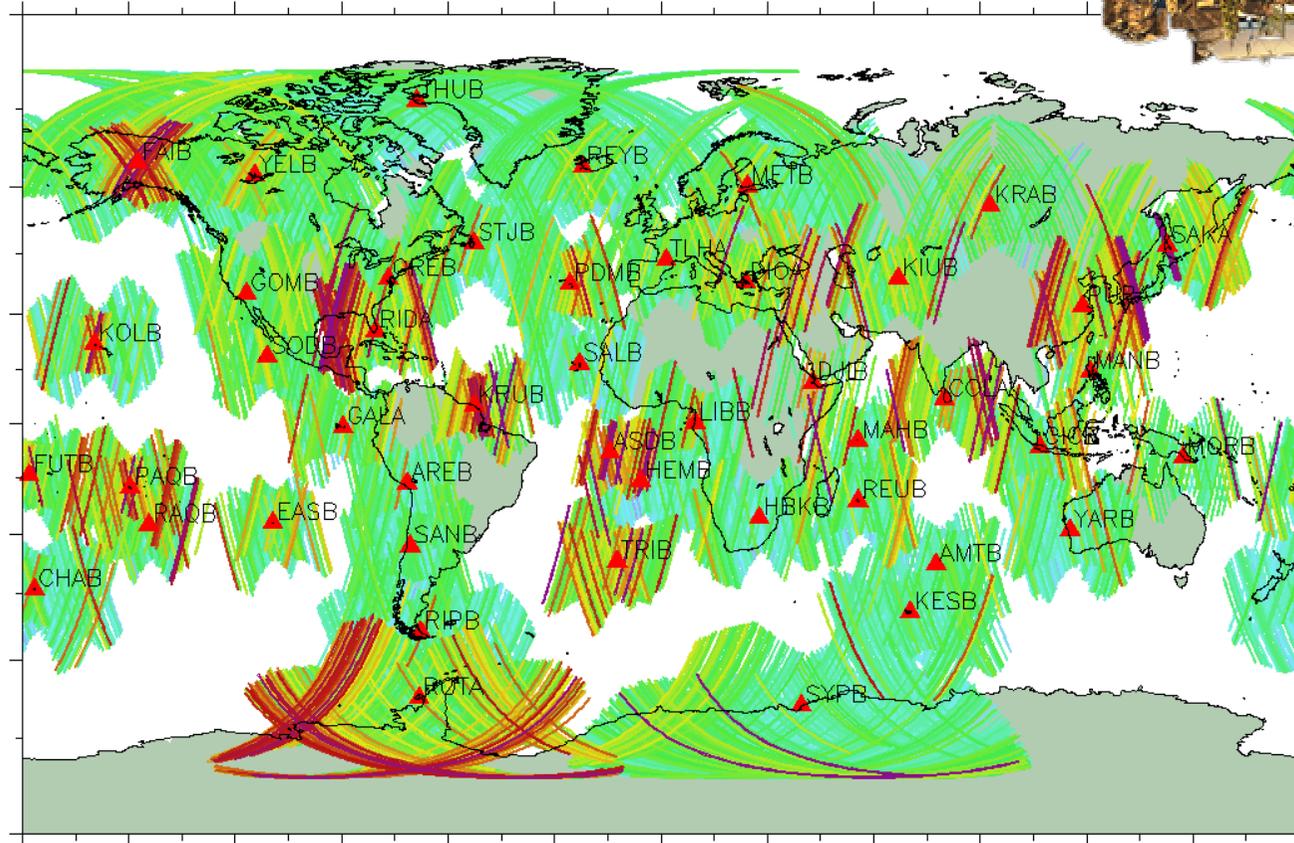
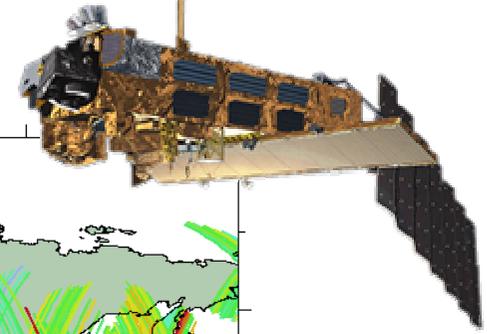


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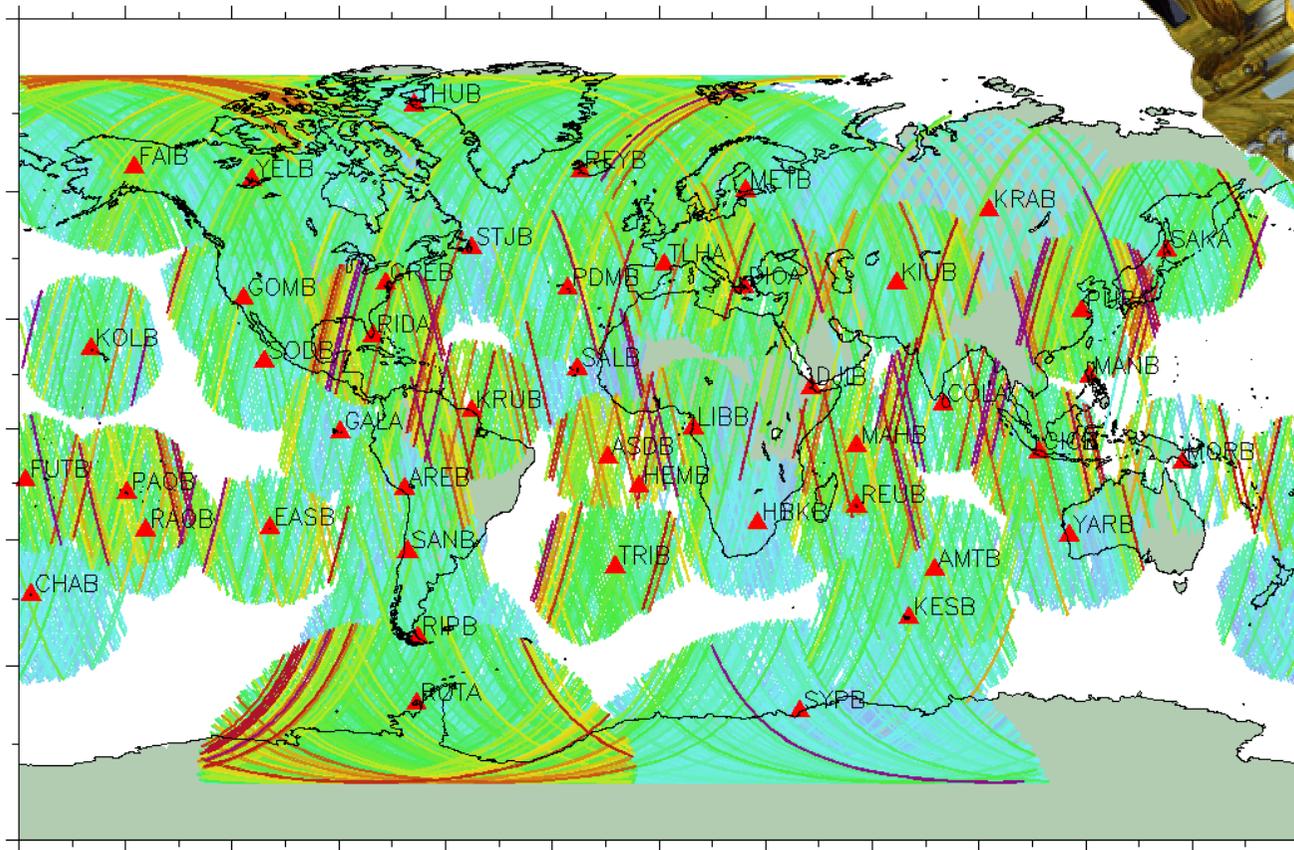
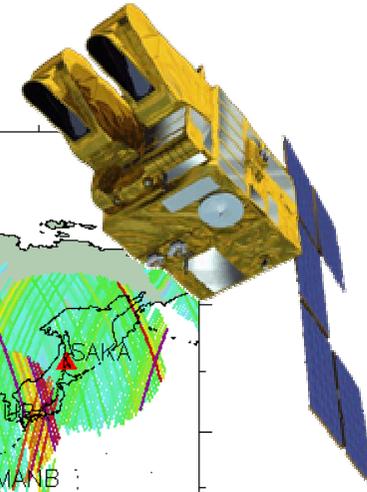
Envisat cycle 15 (2003/03/24 – 2003/04/28)

IGN/JPL

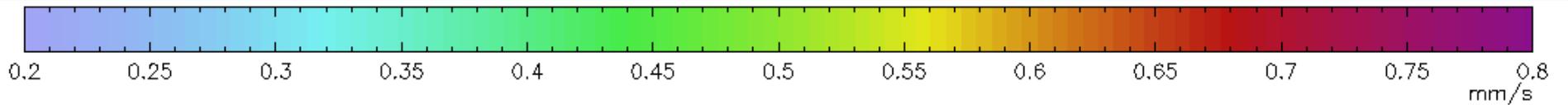


SPOT-5 (2003/03/27 – 2003/04/21)

IGN/JPL

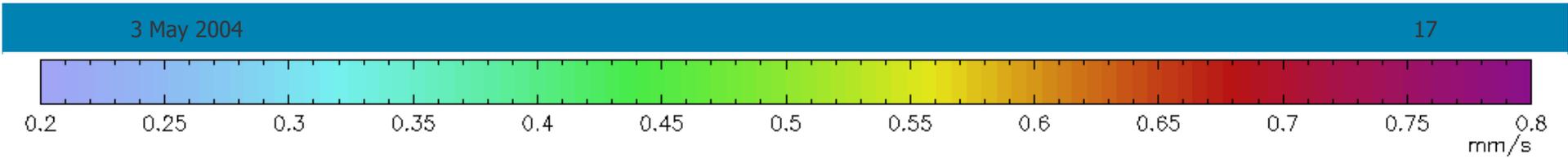
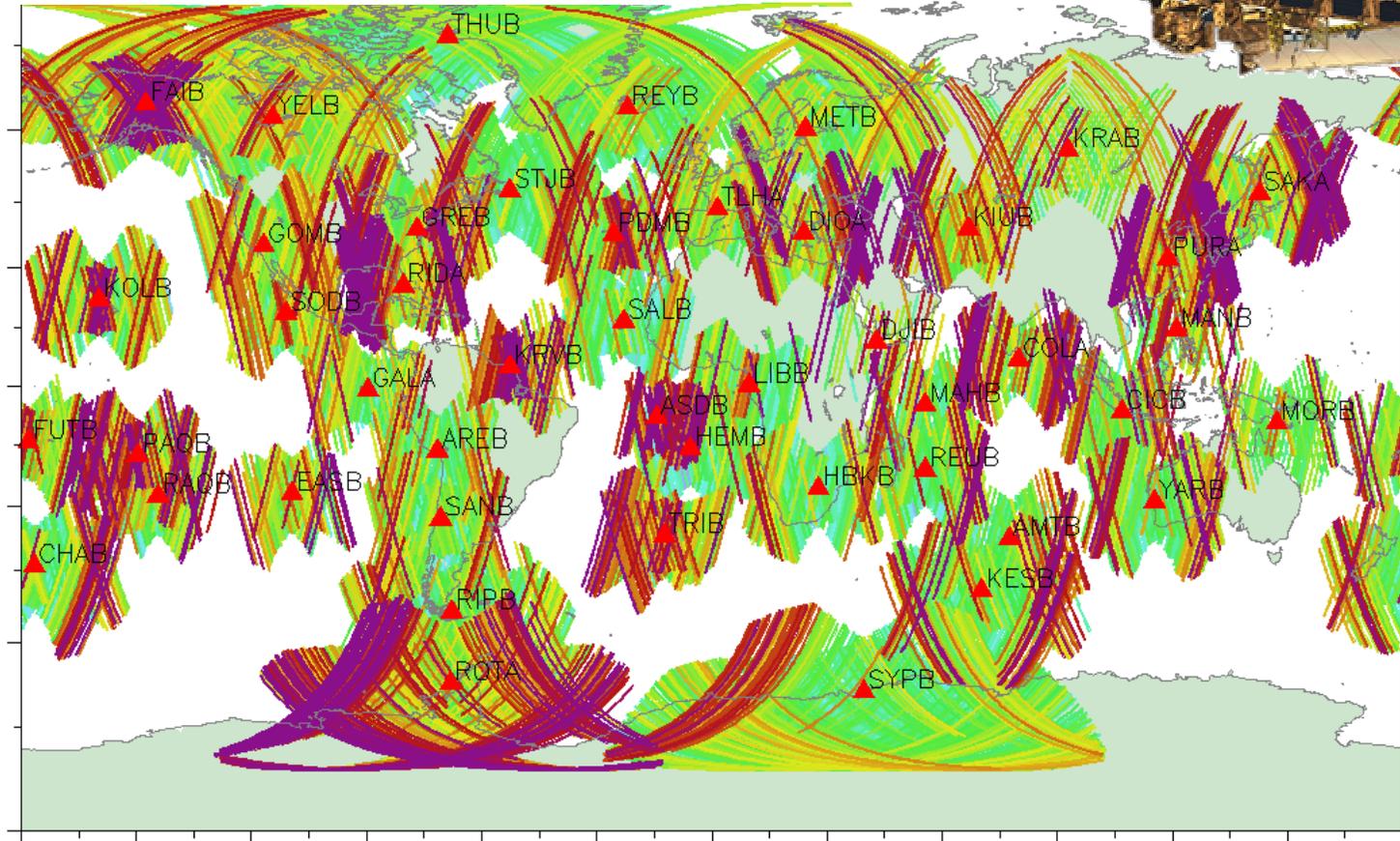
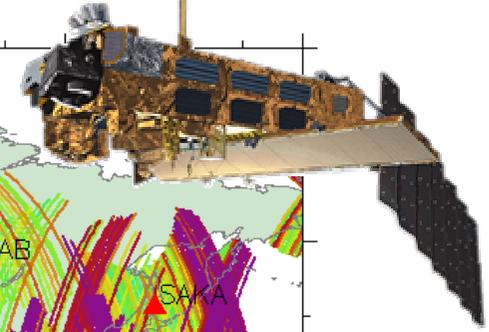


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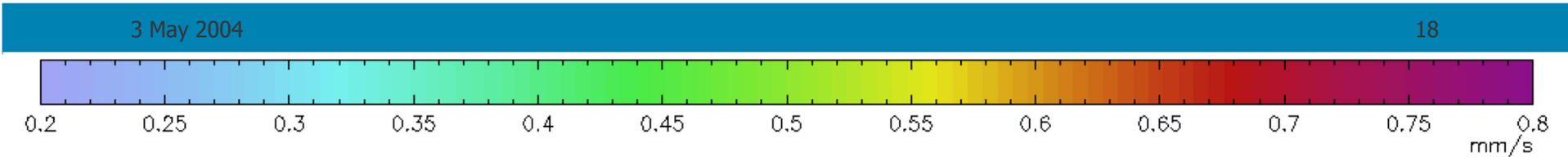
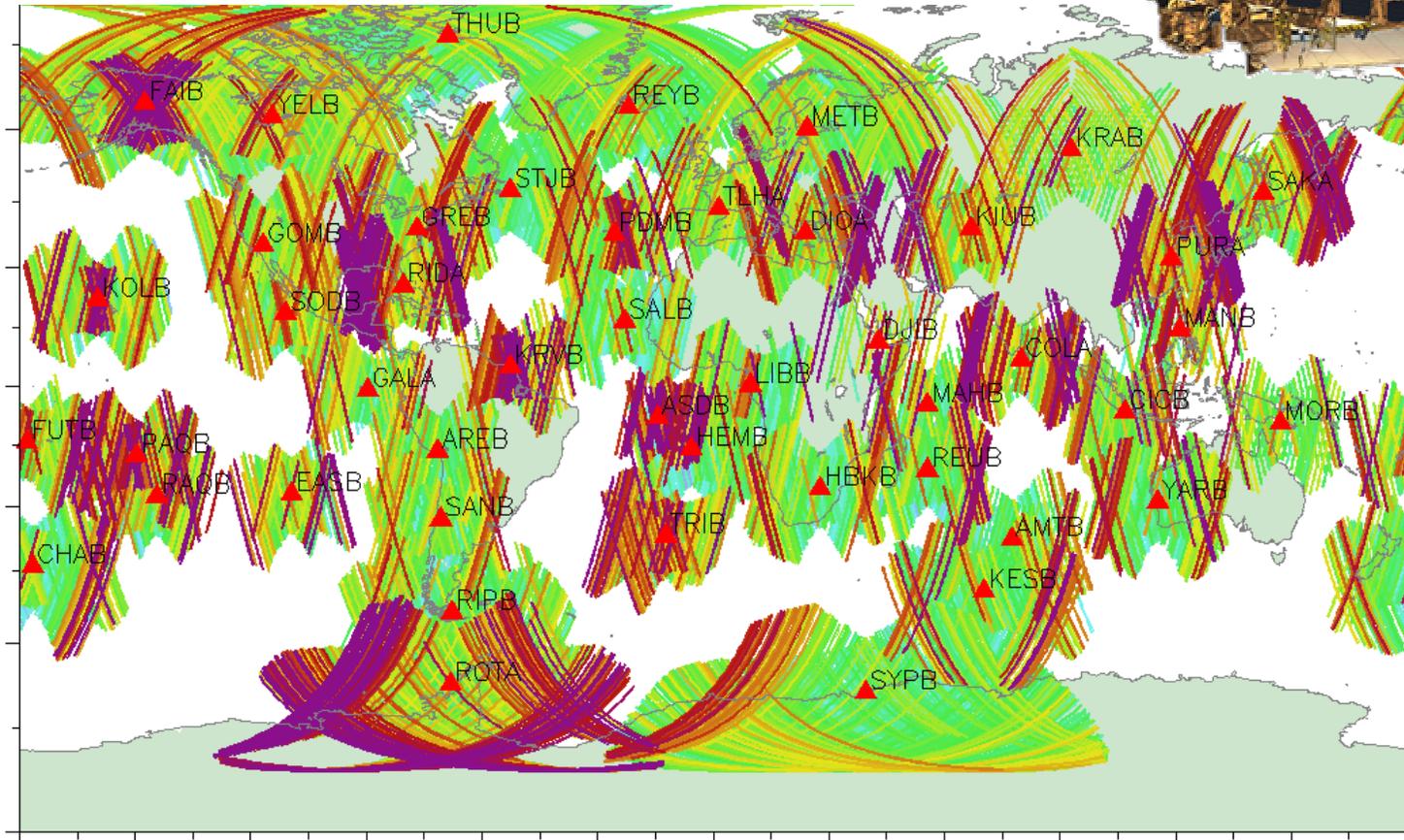
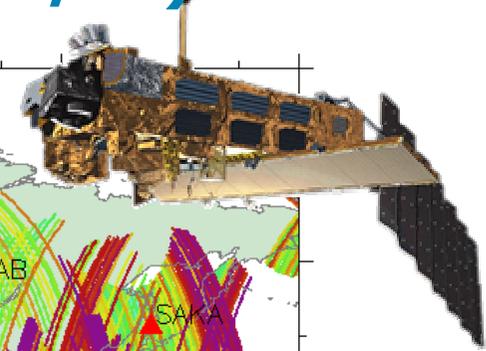
Envisat cycle 15 (2003/03/24 – 2003/04/28)

DEOS alternatives: original



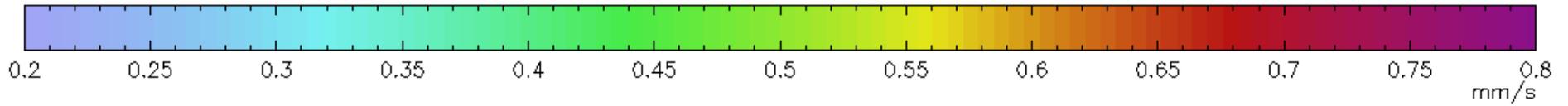
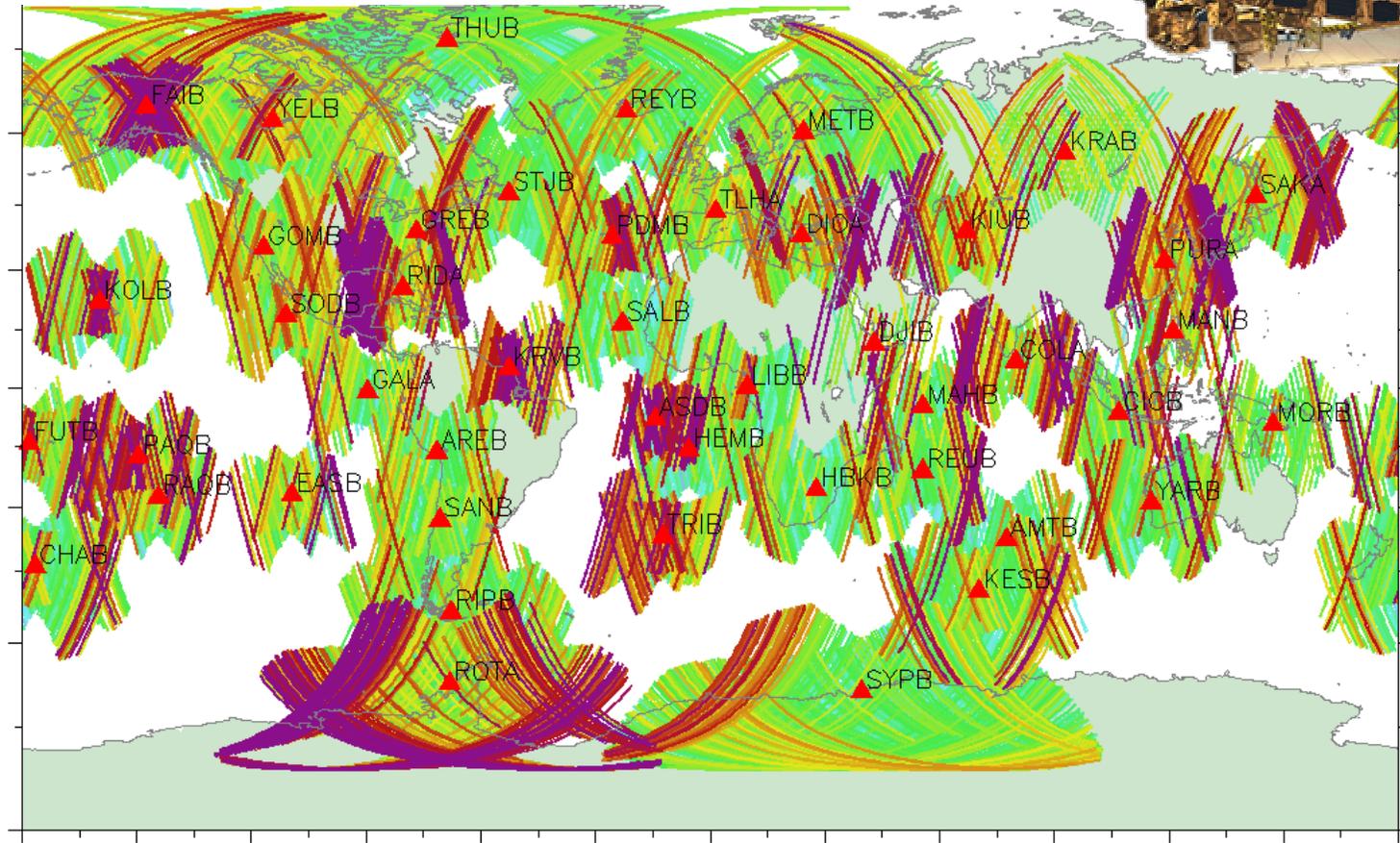
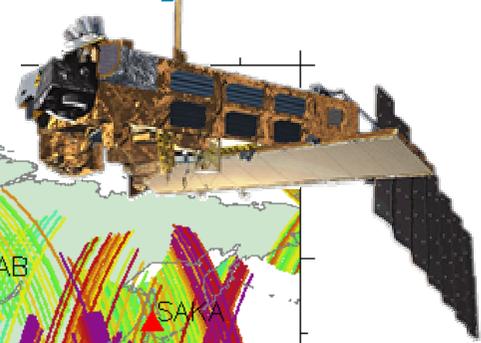
Envisat cycle 15 (2003/03/24 – 2003/04/28)

DEOS alternatives: SLR downweighted



Envisat cycle 15 (2003/03/24 – 2003/04/28)

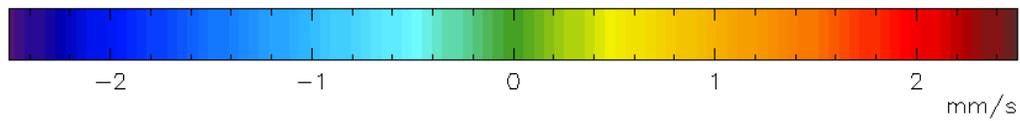
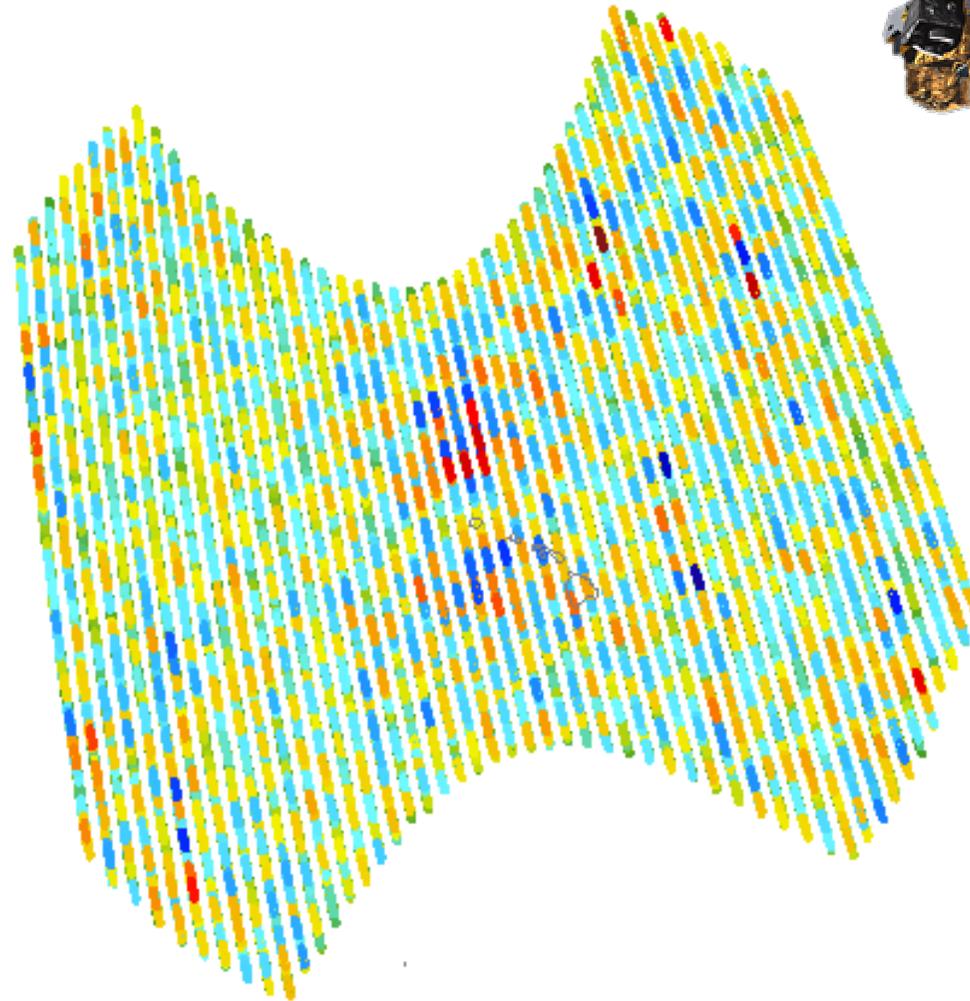
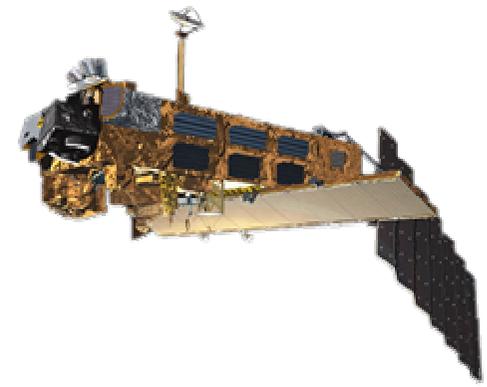
DEOS alternatives: coordinates estimated



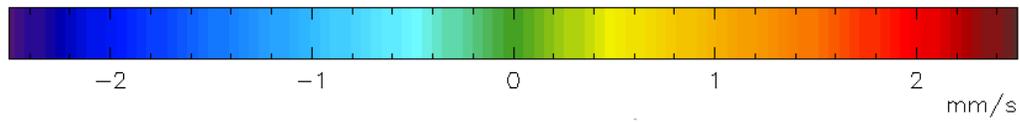
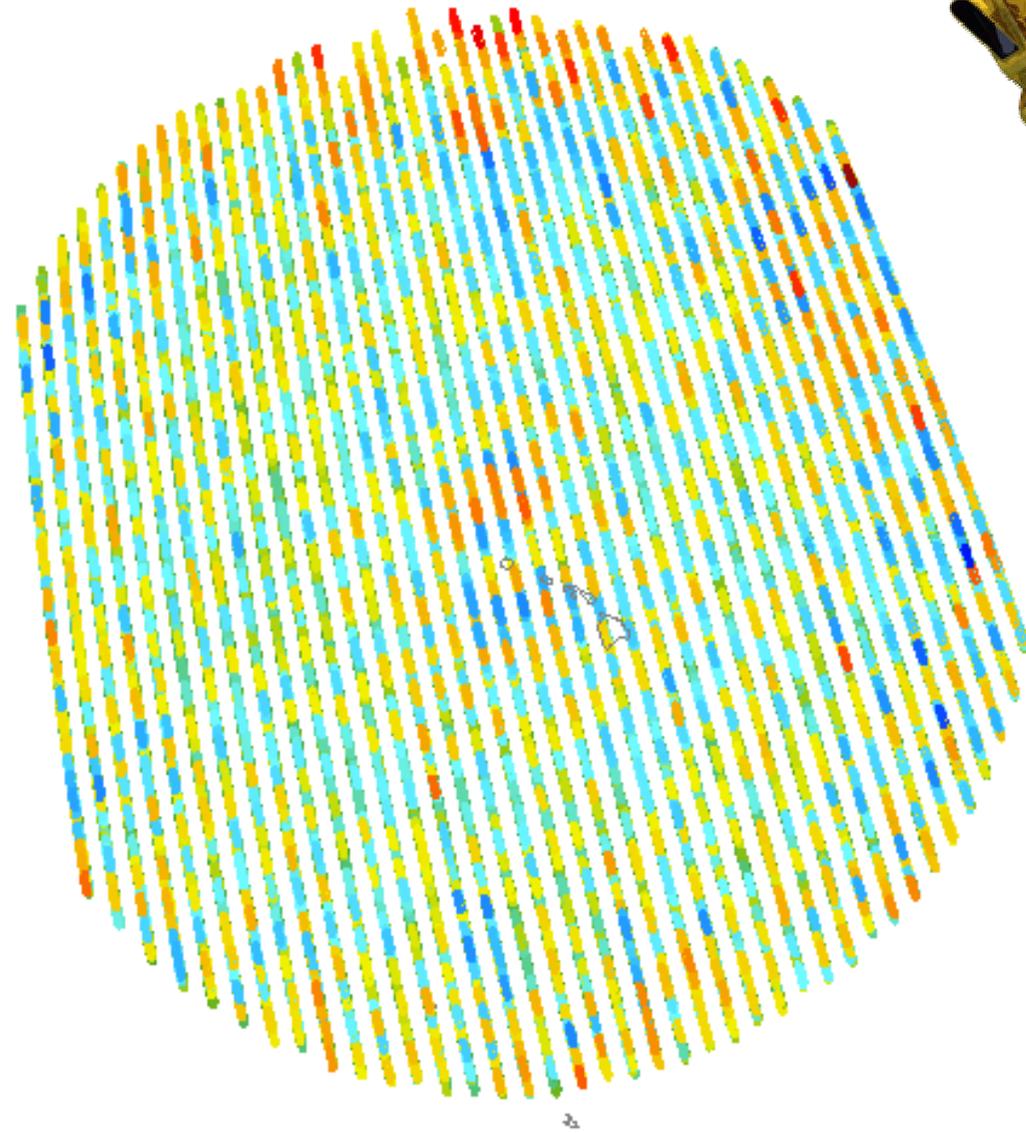
Summary: global RMS residual analysis

- TOPEX/Poseidon:
 - Results of DEOS, CSR and IGN/JPL very similar
- Jason-1:
 - Differences due to different editing and processing strategies for SAA data
- Envisat:
 - DEOS and ESOC results similar
 - IGN/JPL residuals look much better!
- Stations which need further investigation:
 - ROTA, FAIB, MSOB, RIDA, KRUB/KRVB

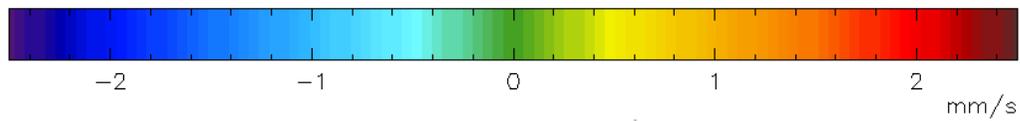
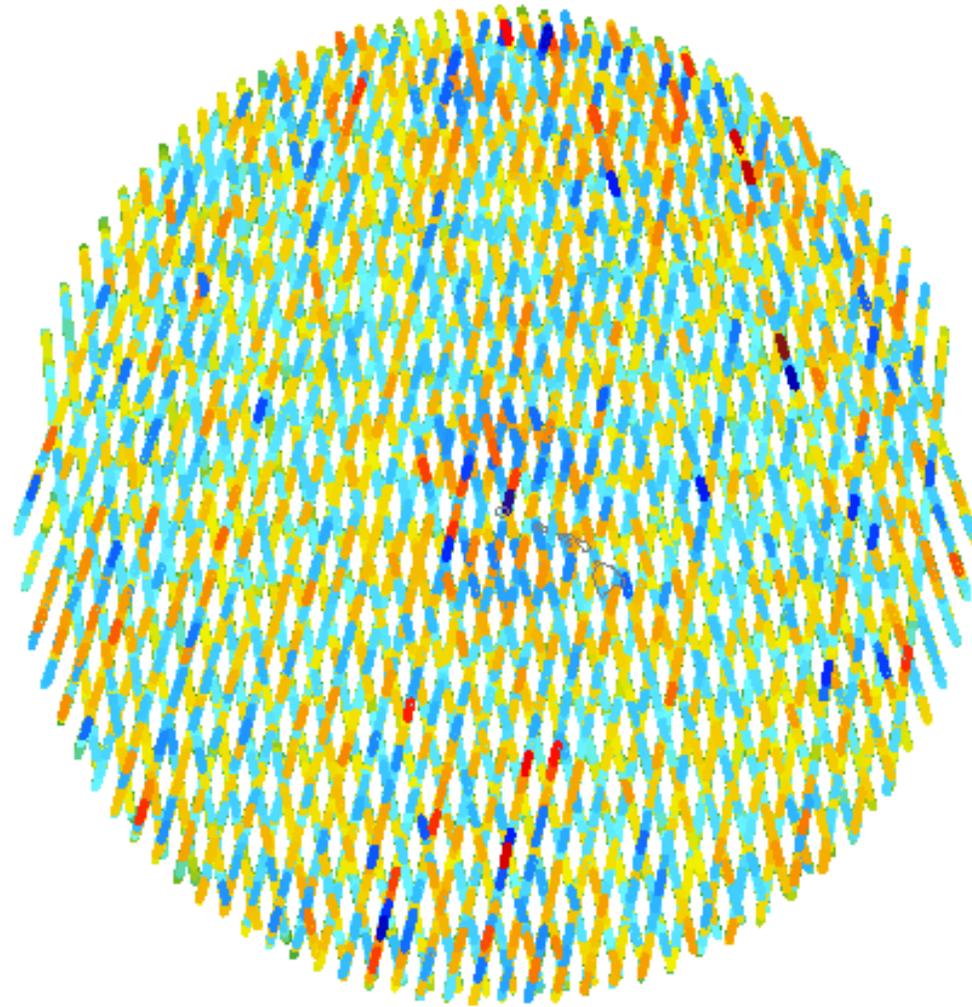
KOLB Envisat



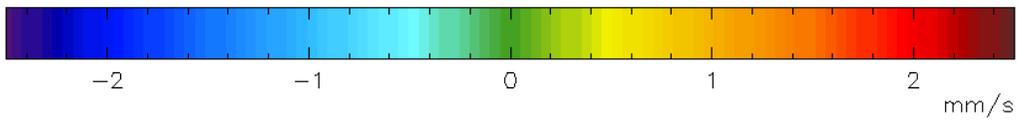
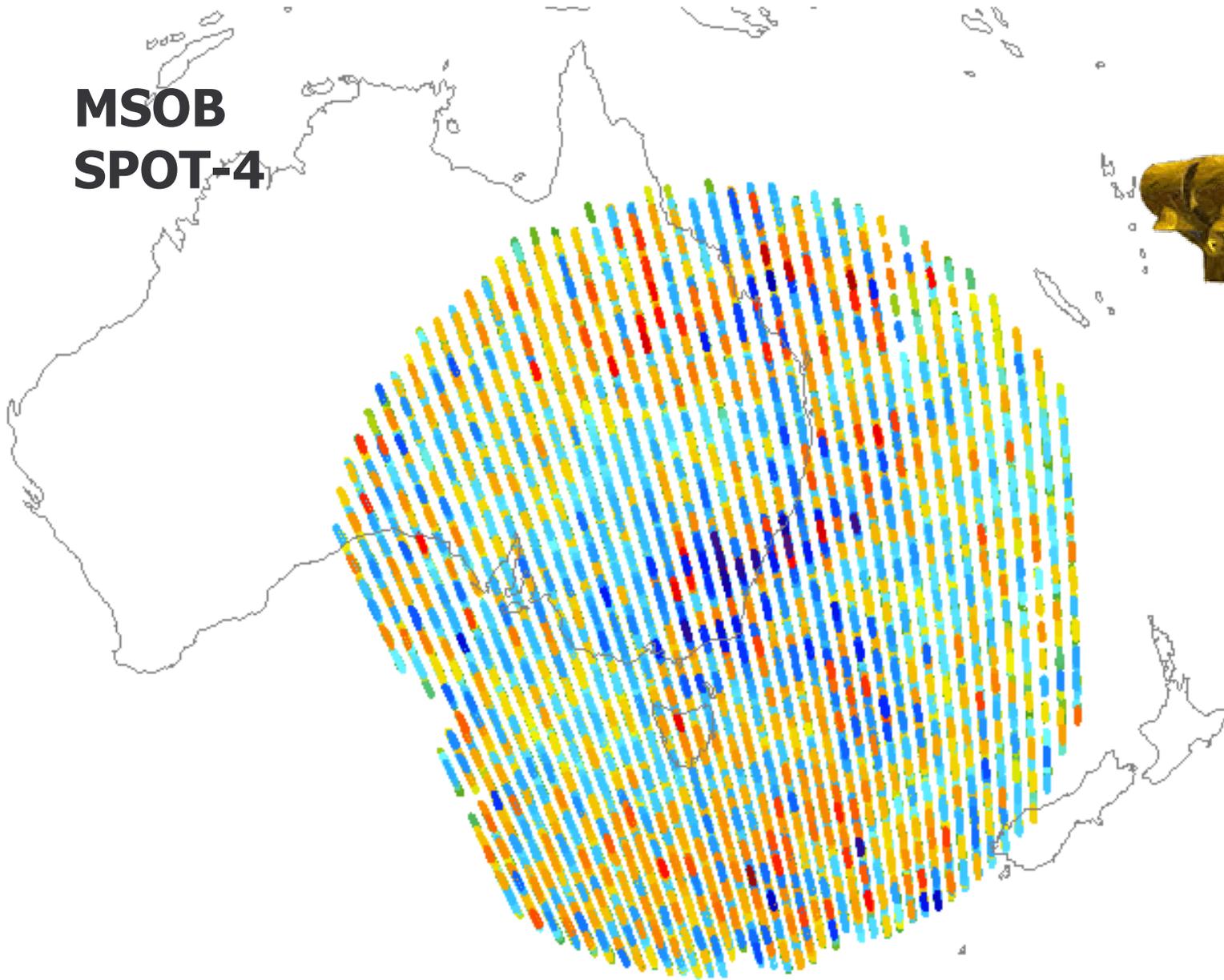
KOLB SPOT-5



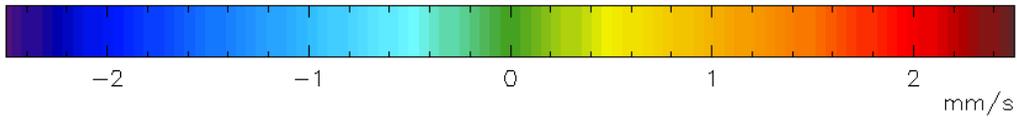
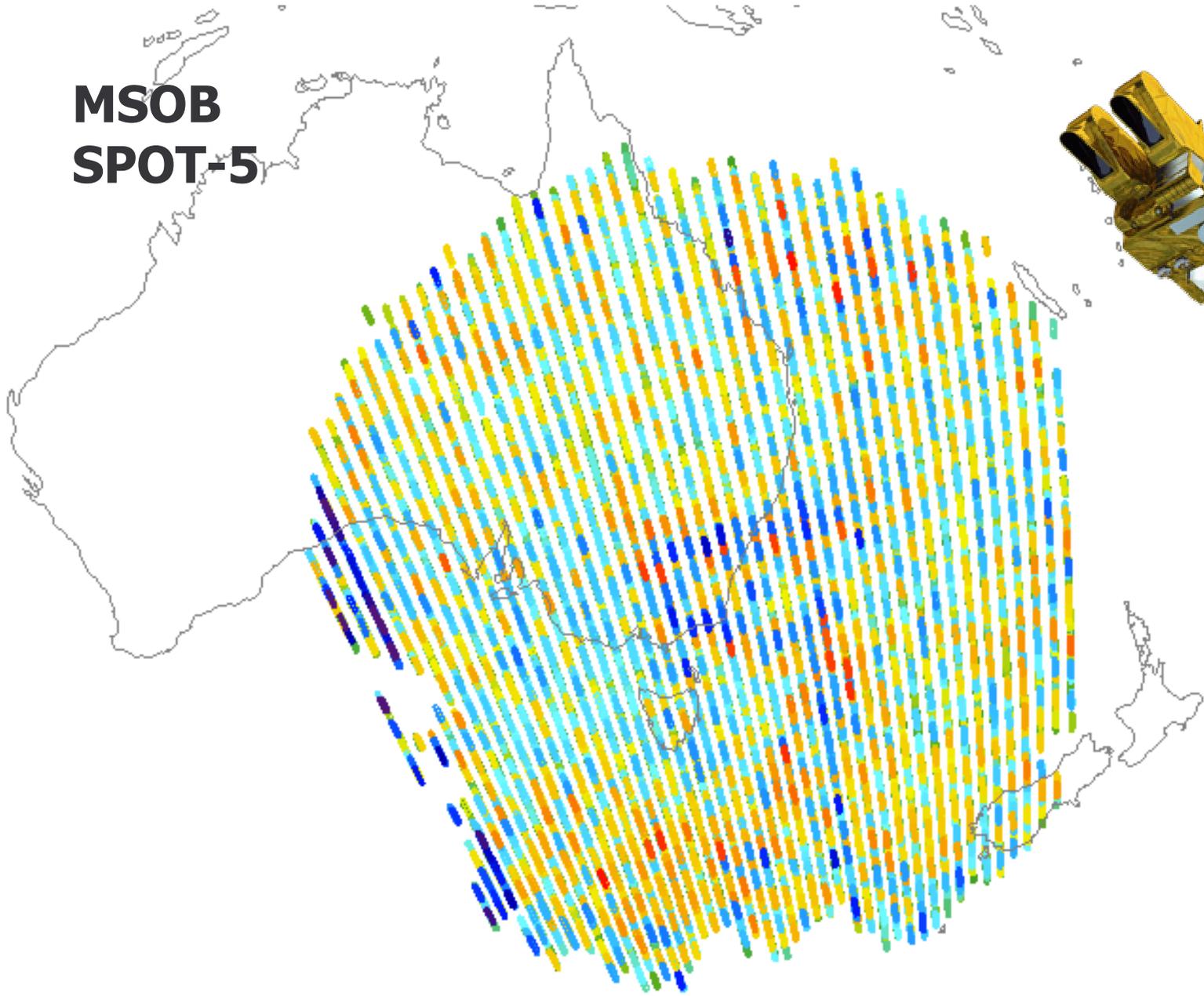
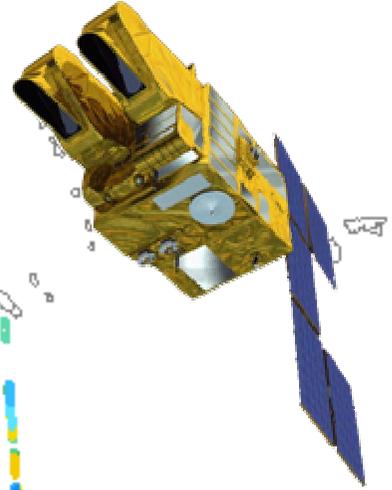
KOLB SPOT-4



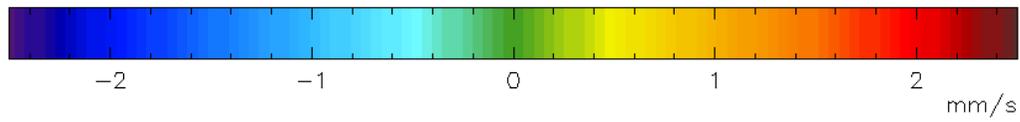
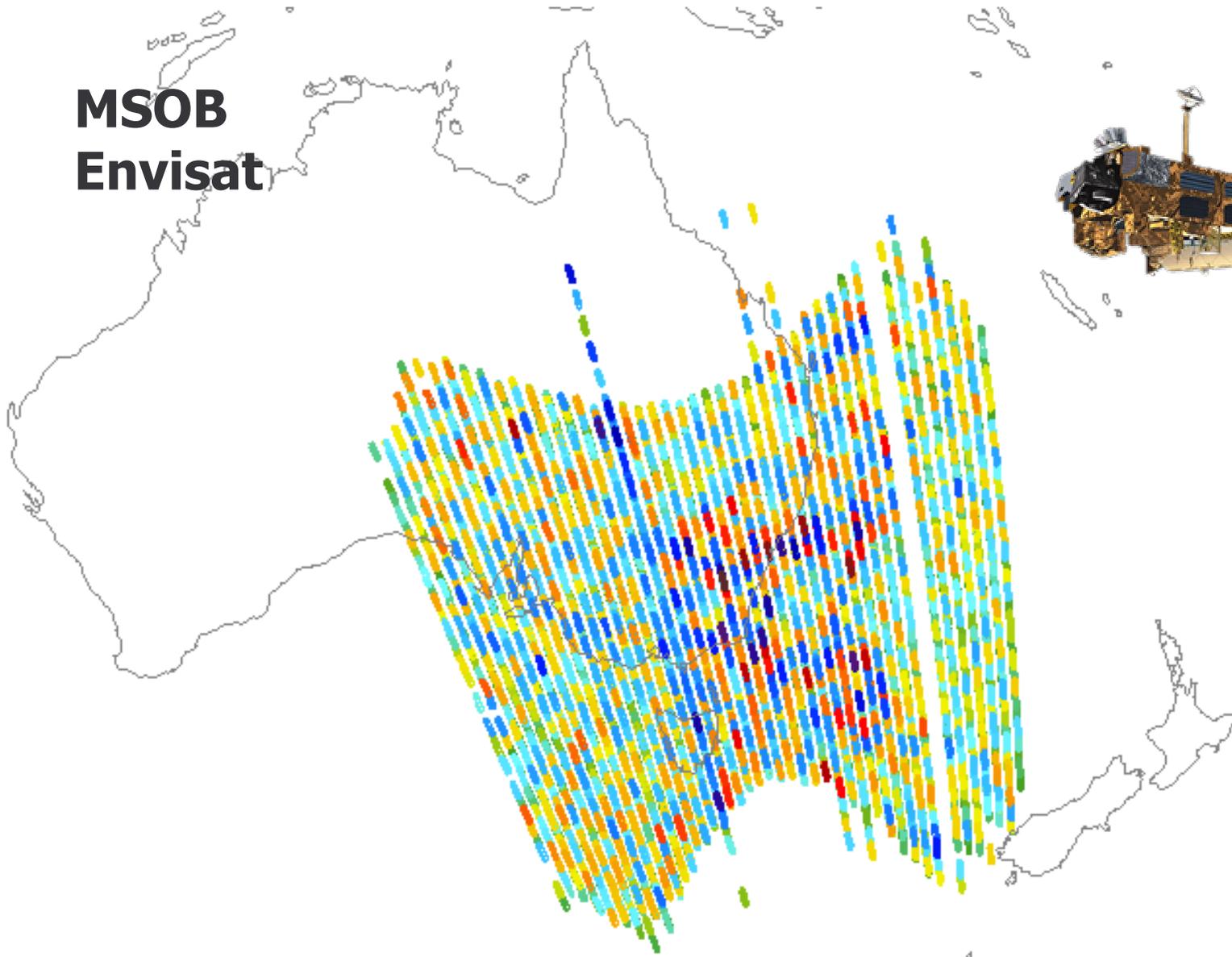
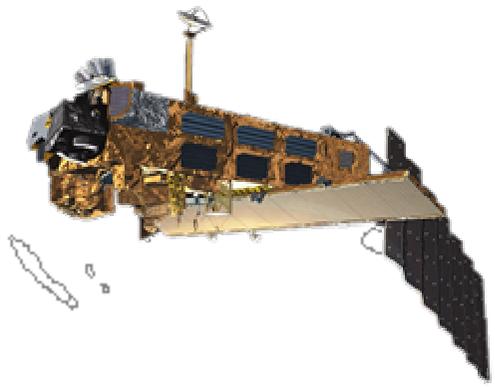
MSOB SPOT-4



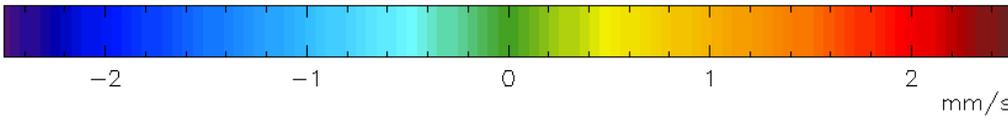
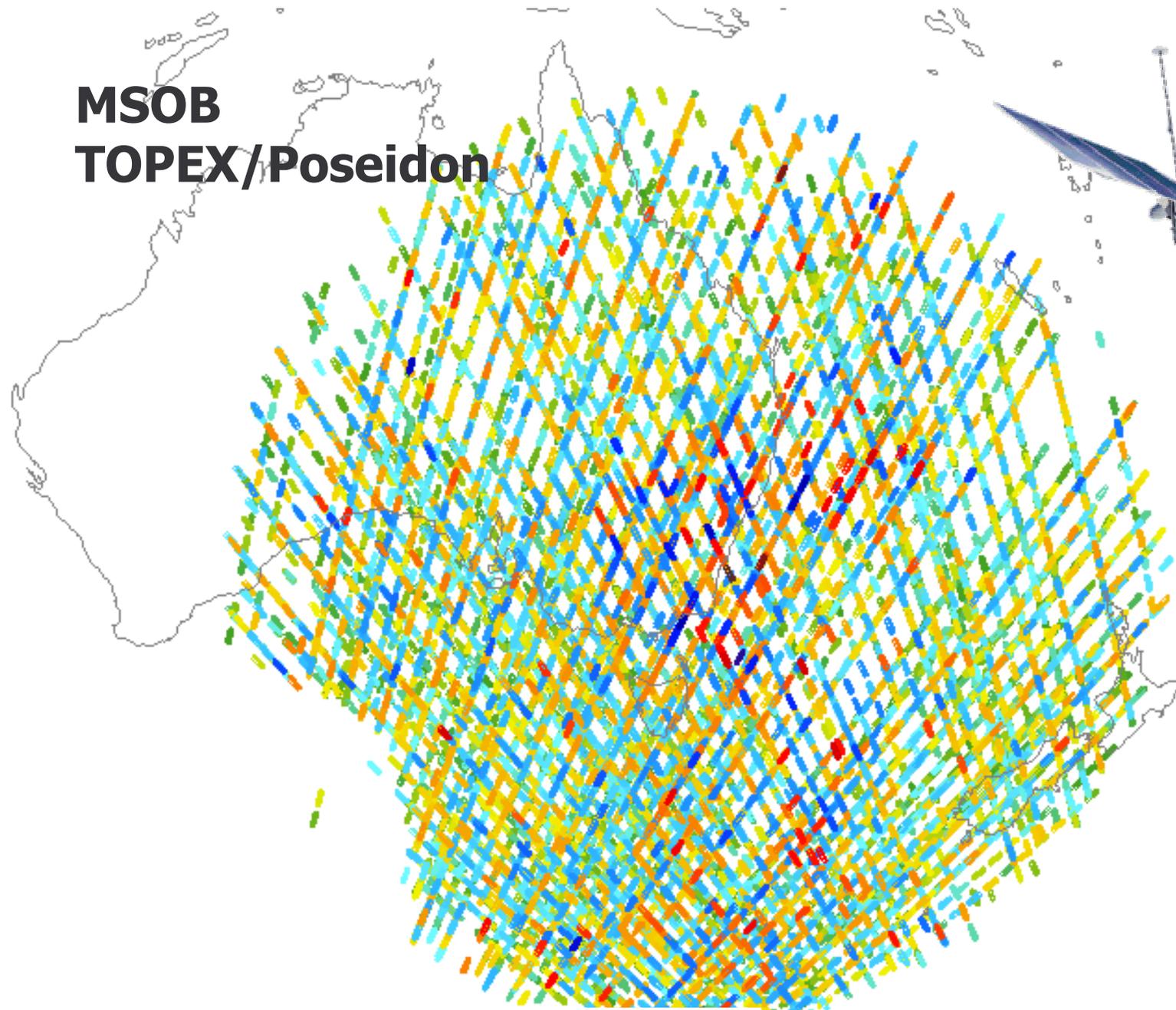
MSOB SPOT-5



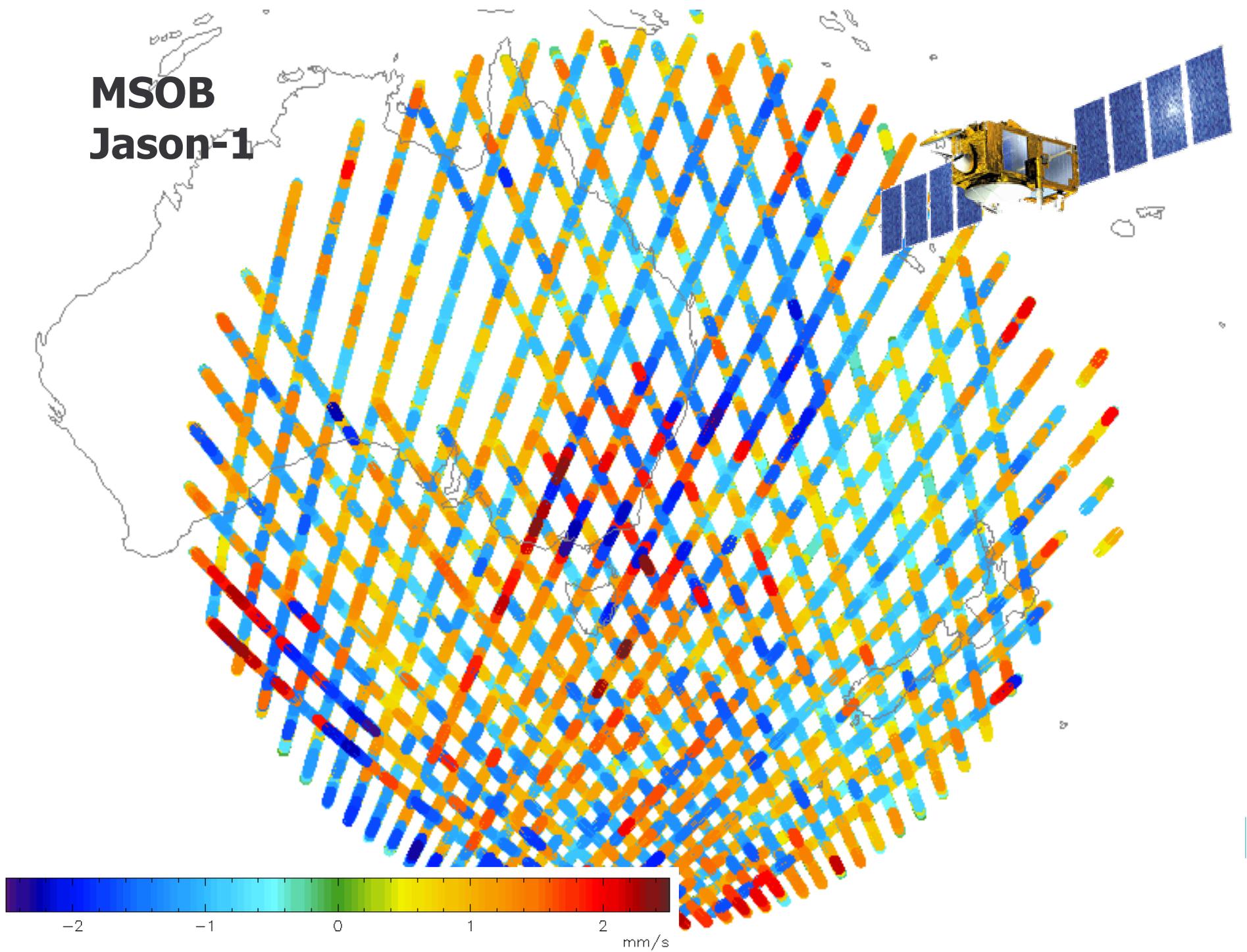
MSOB
Envisat



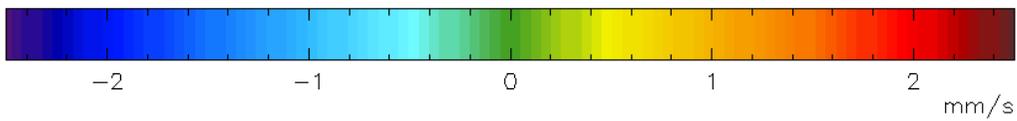
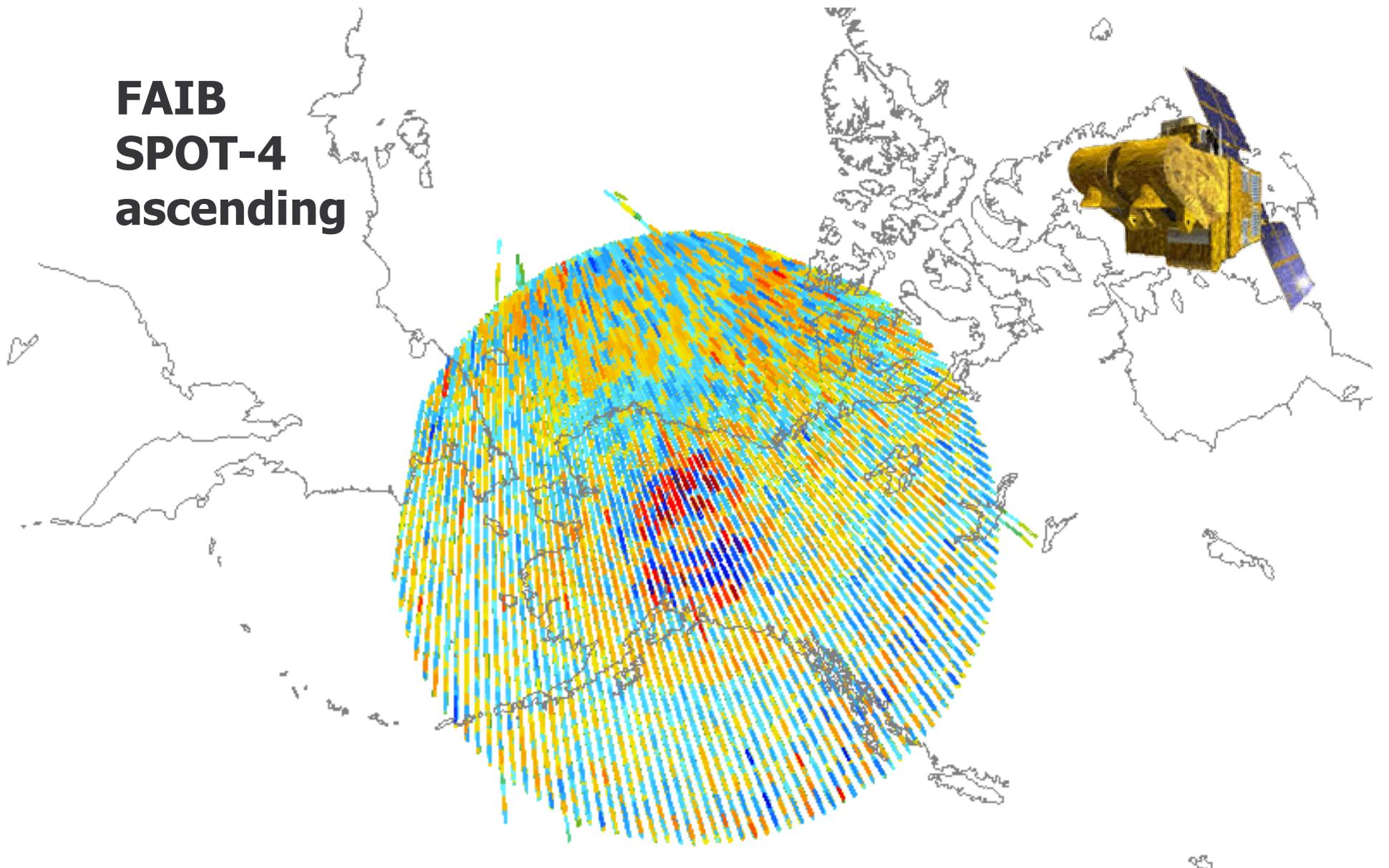
MSOB TOPEX/Poseidon



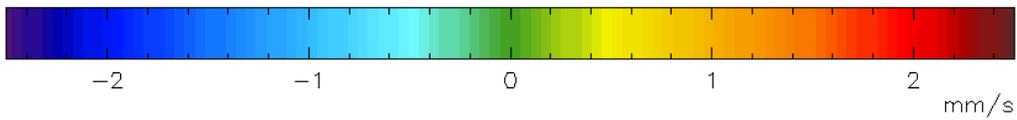
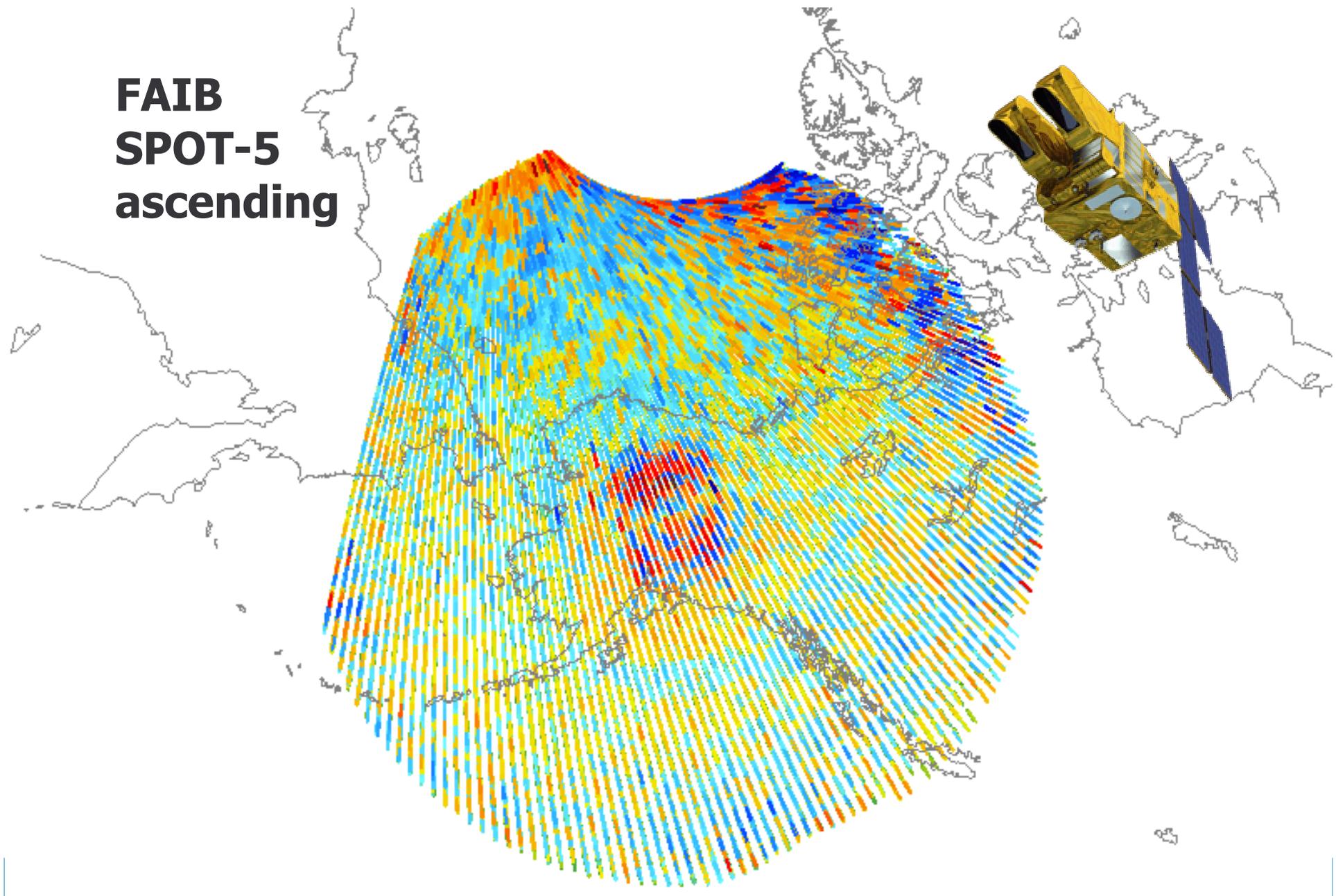
MSOB Jason-1



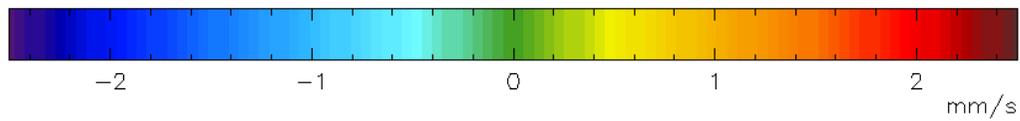
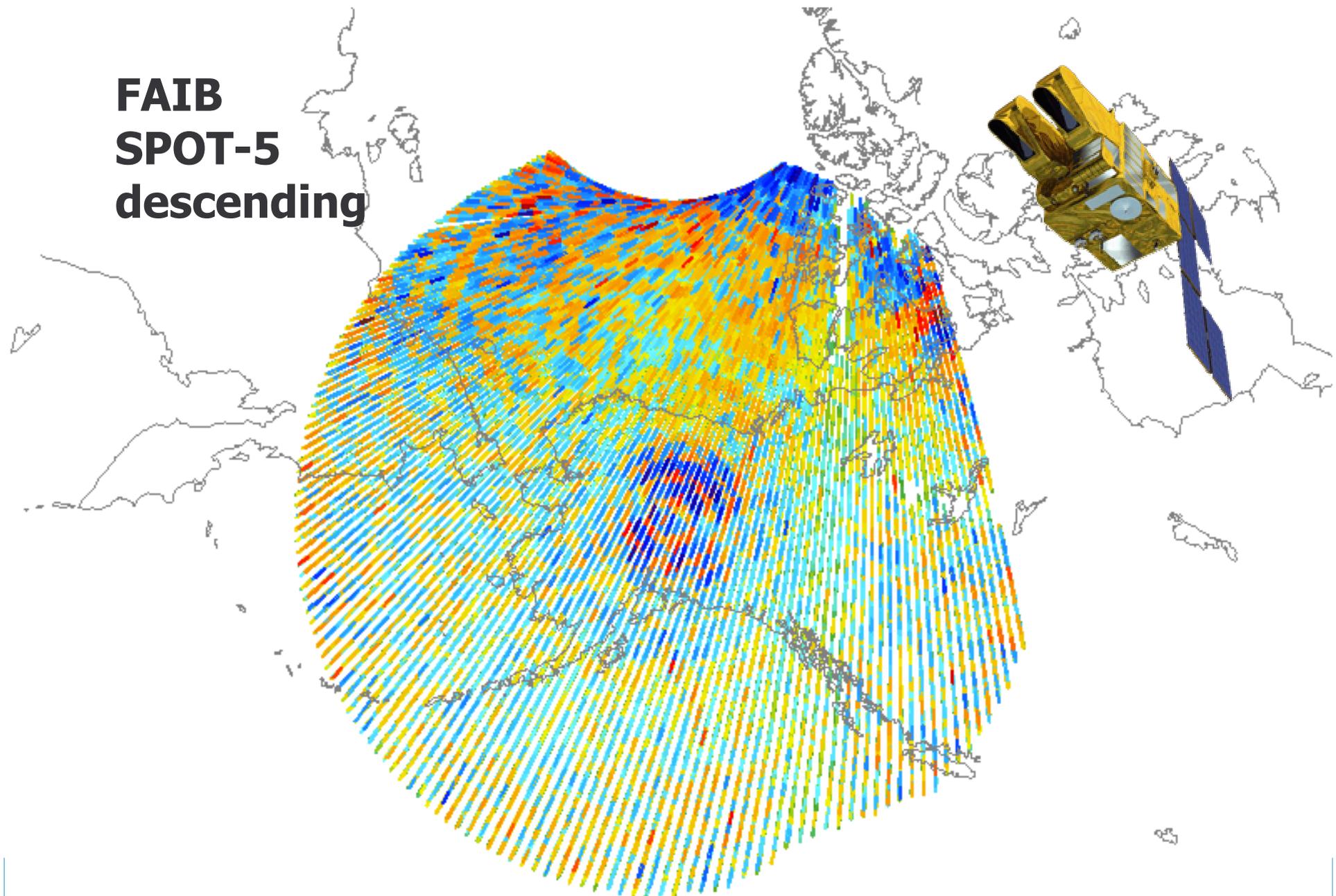
**FAIB
SPOT-4
ascending**



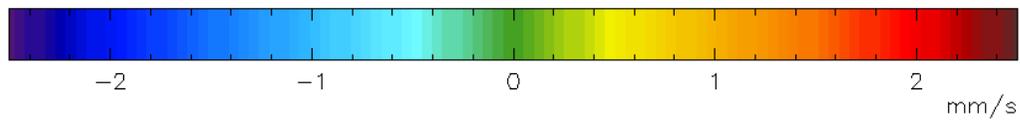
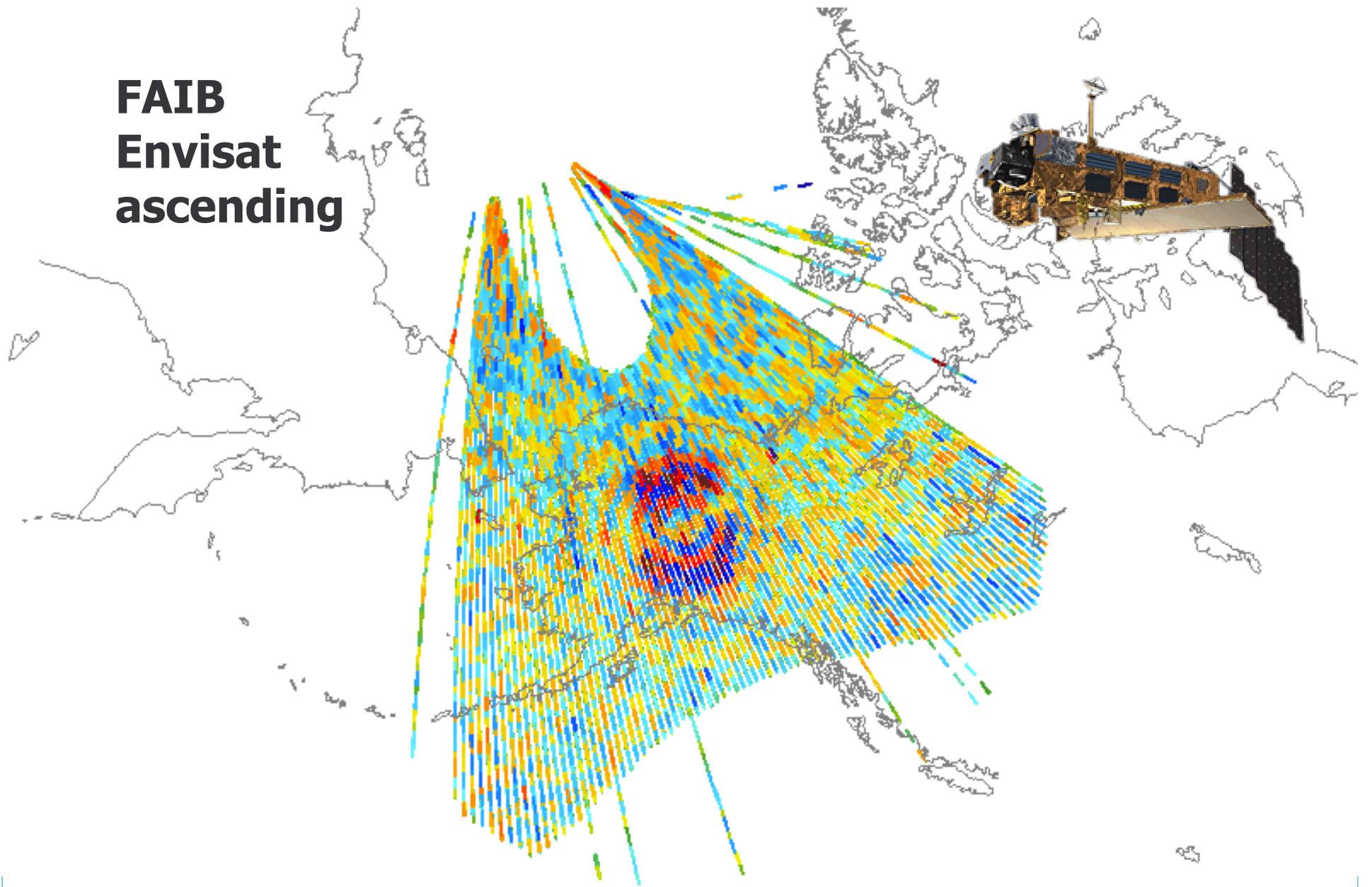
**FAIB
SPOT-5
ascending**



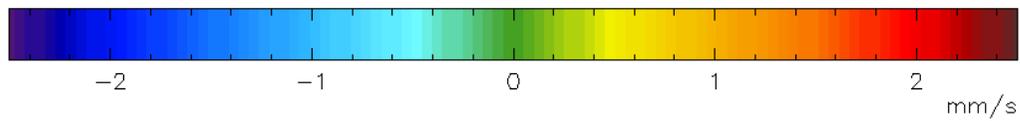
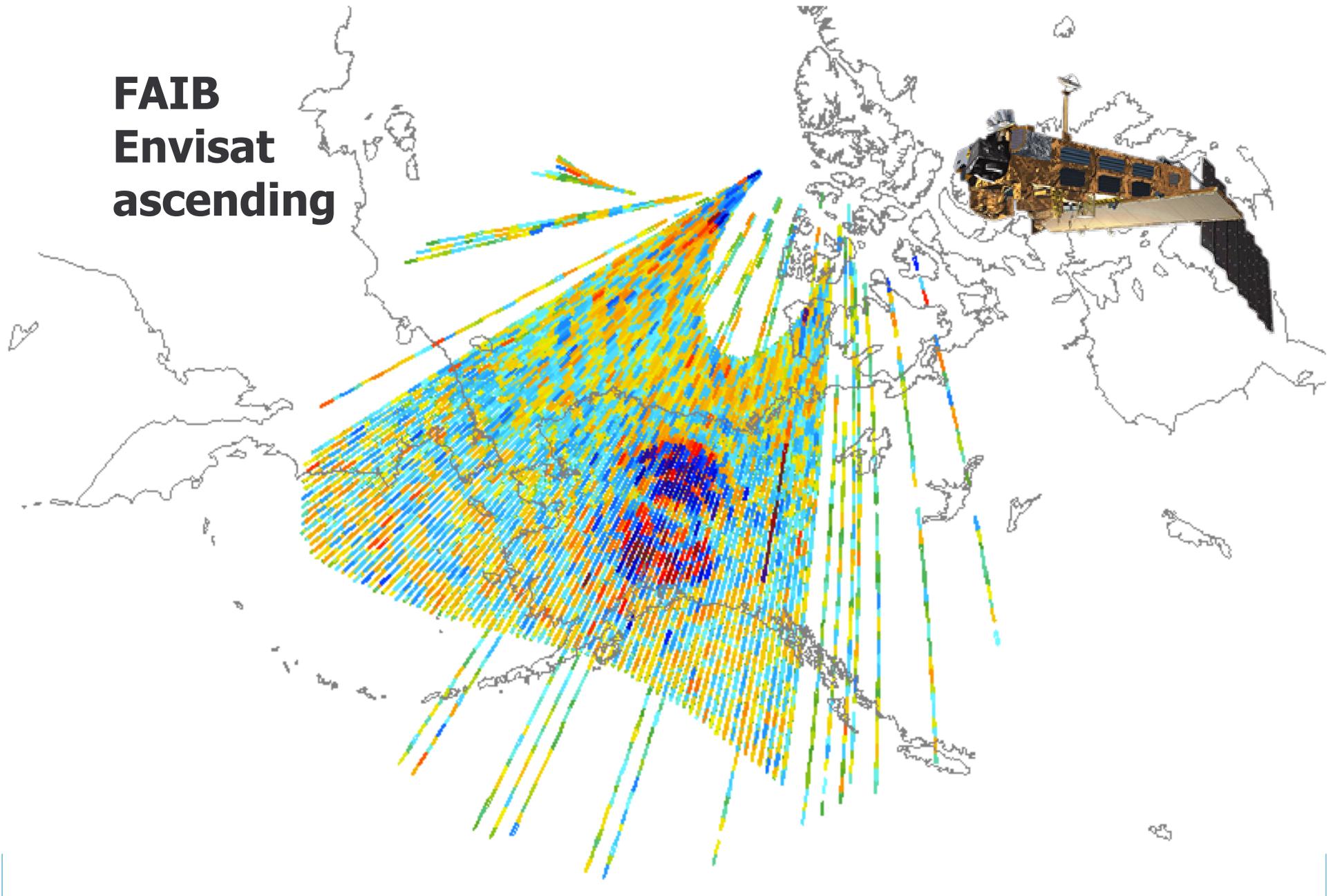
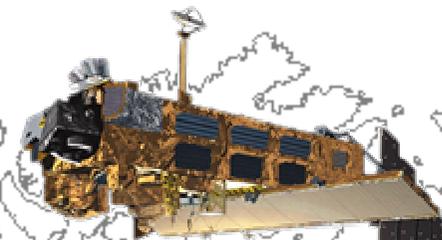
**FAIB
SPOT-5
descending**



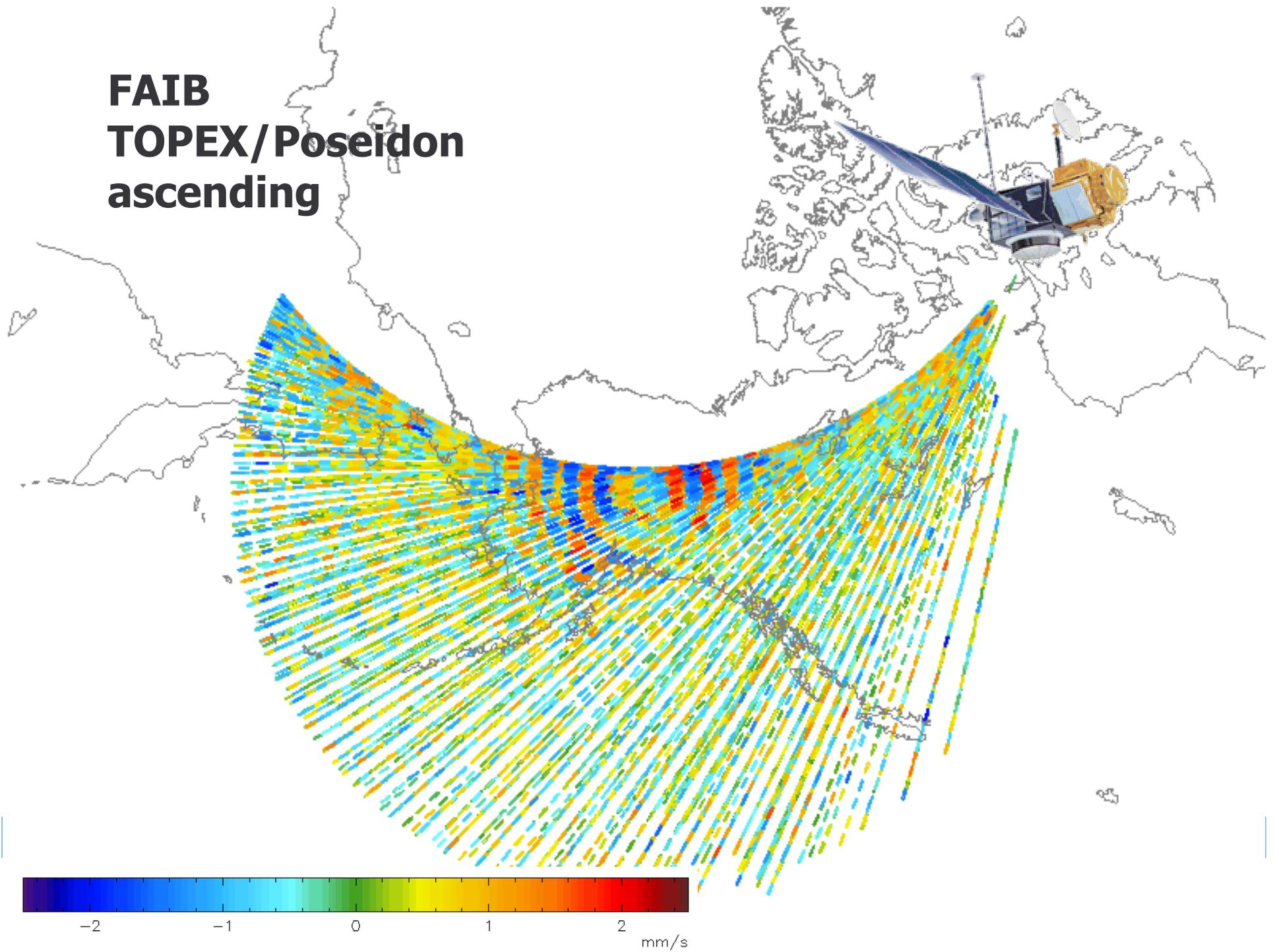
**FAIB
Envisat
ascending**



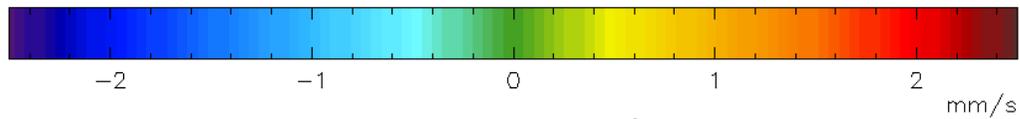
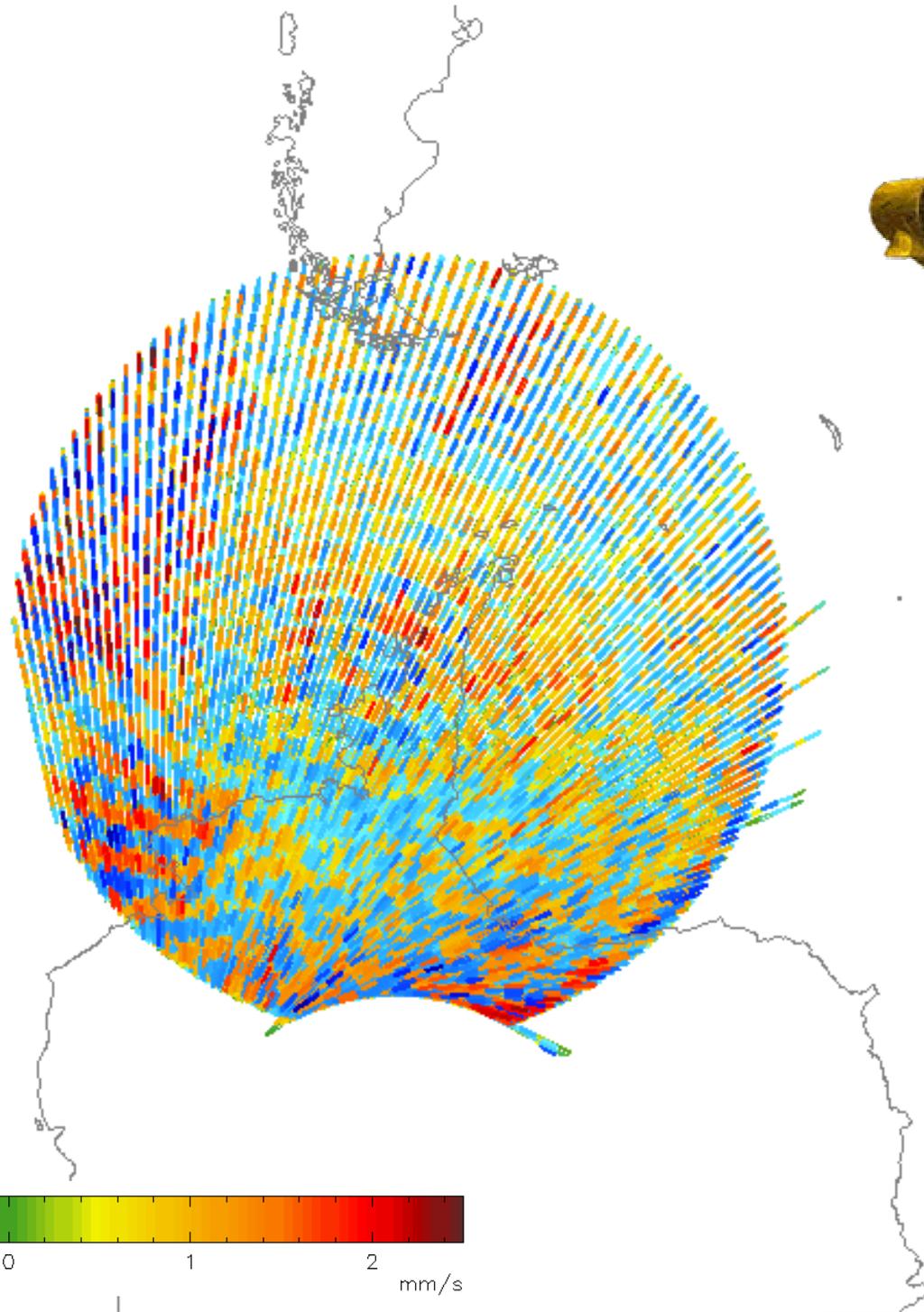
**FAIB
Envisat
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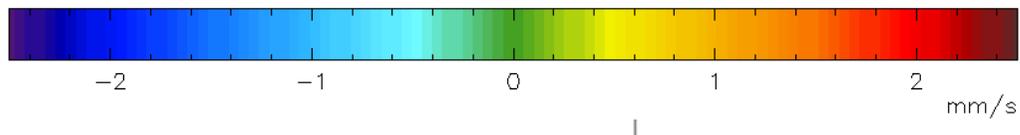
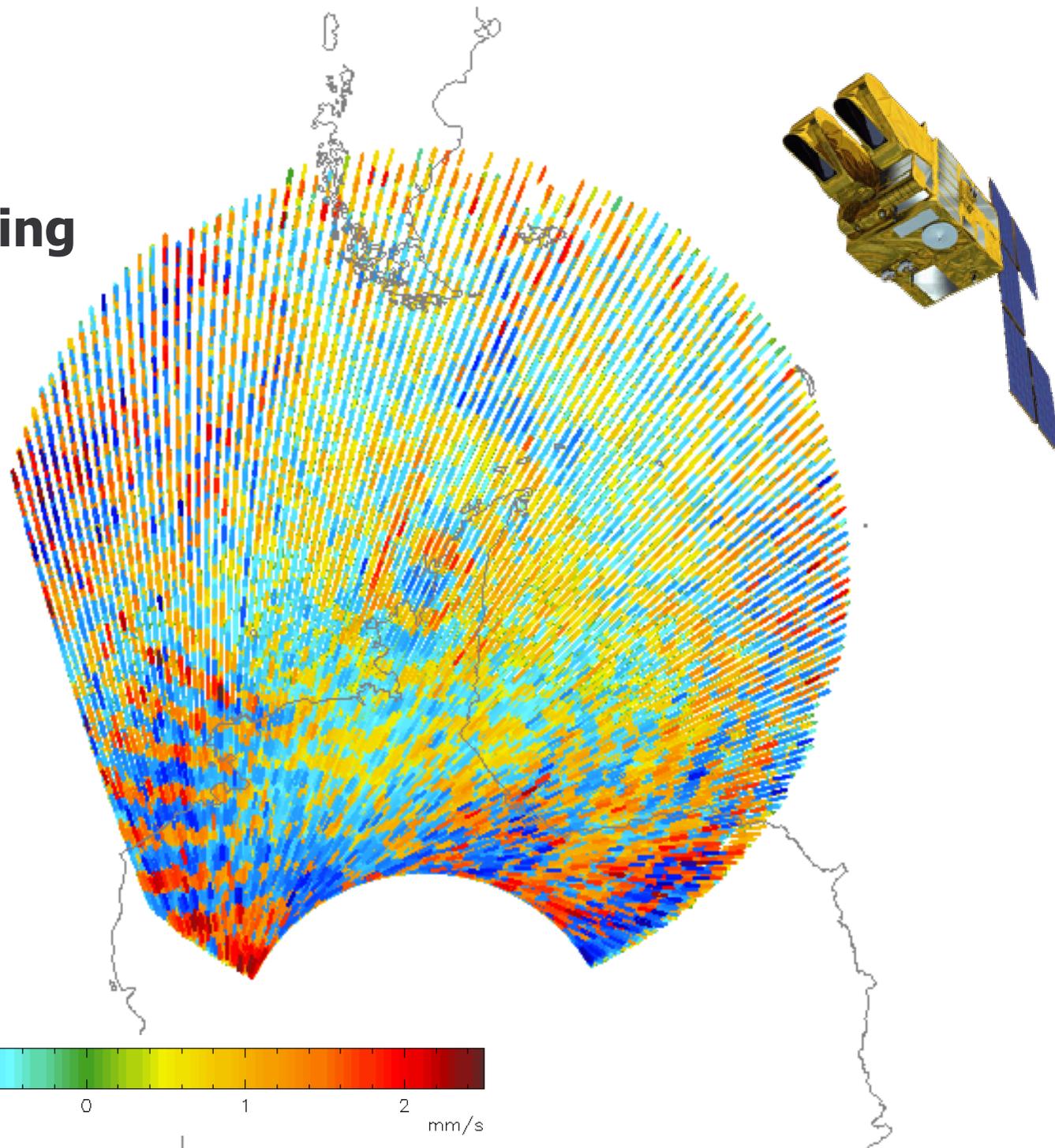
**FAIB
TOPEX/Poseidon
ascending**



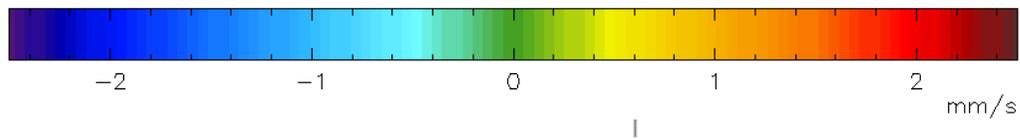
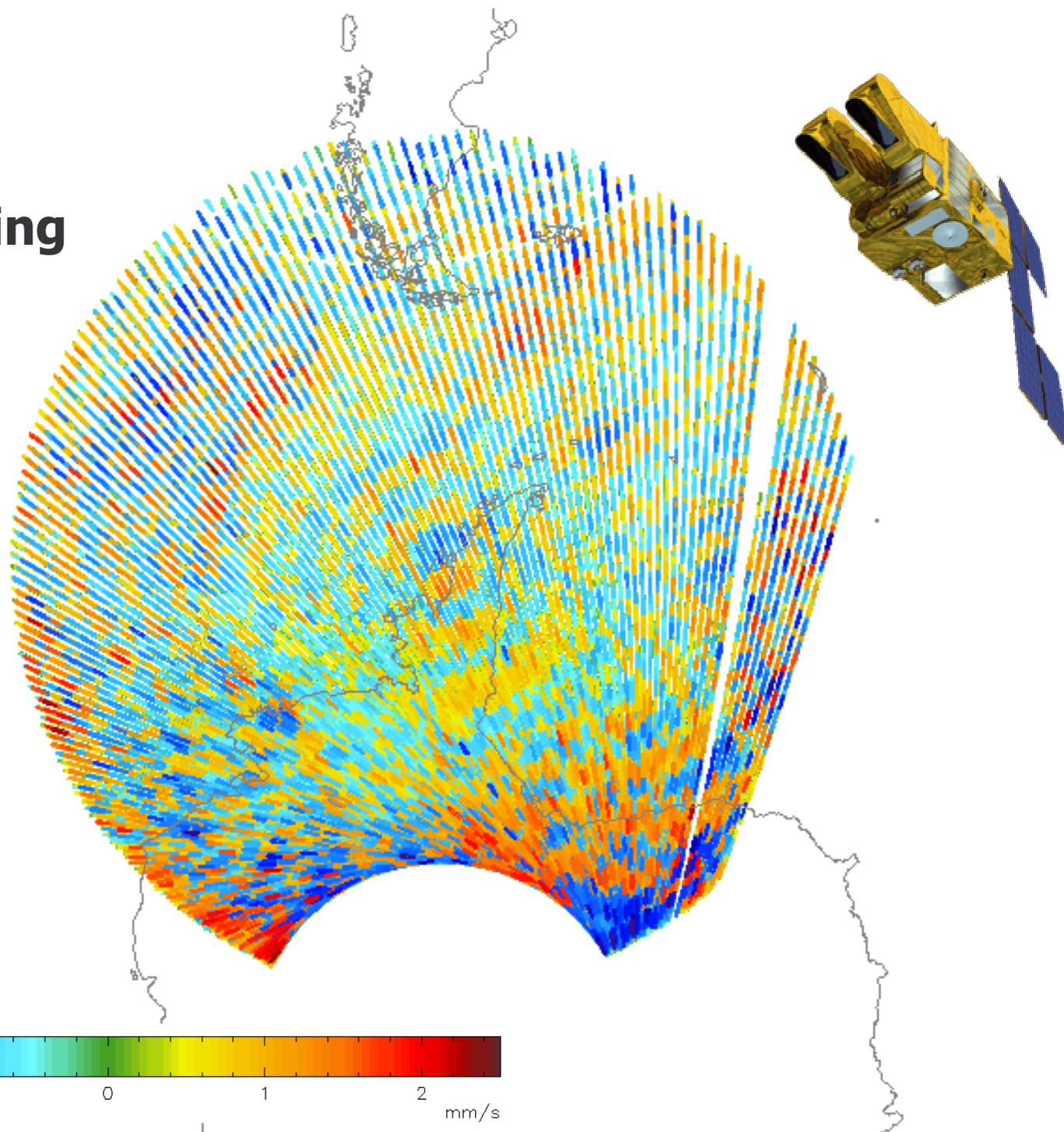
**ROTA
SPOT-4
descending**



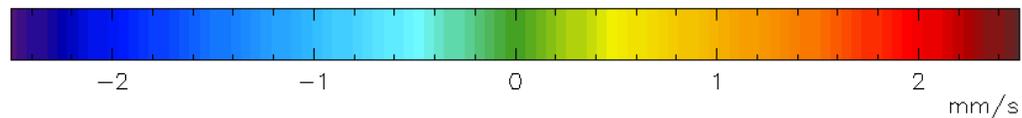
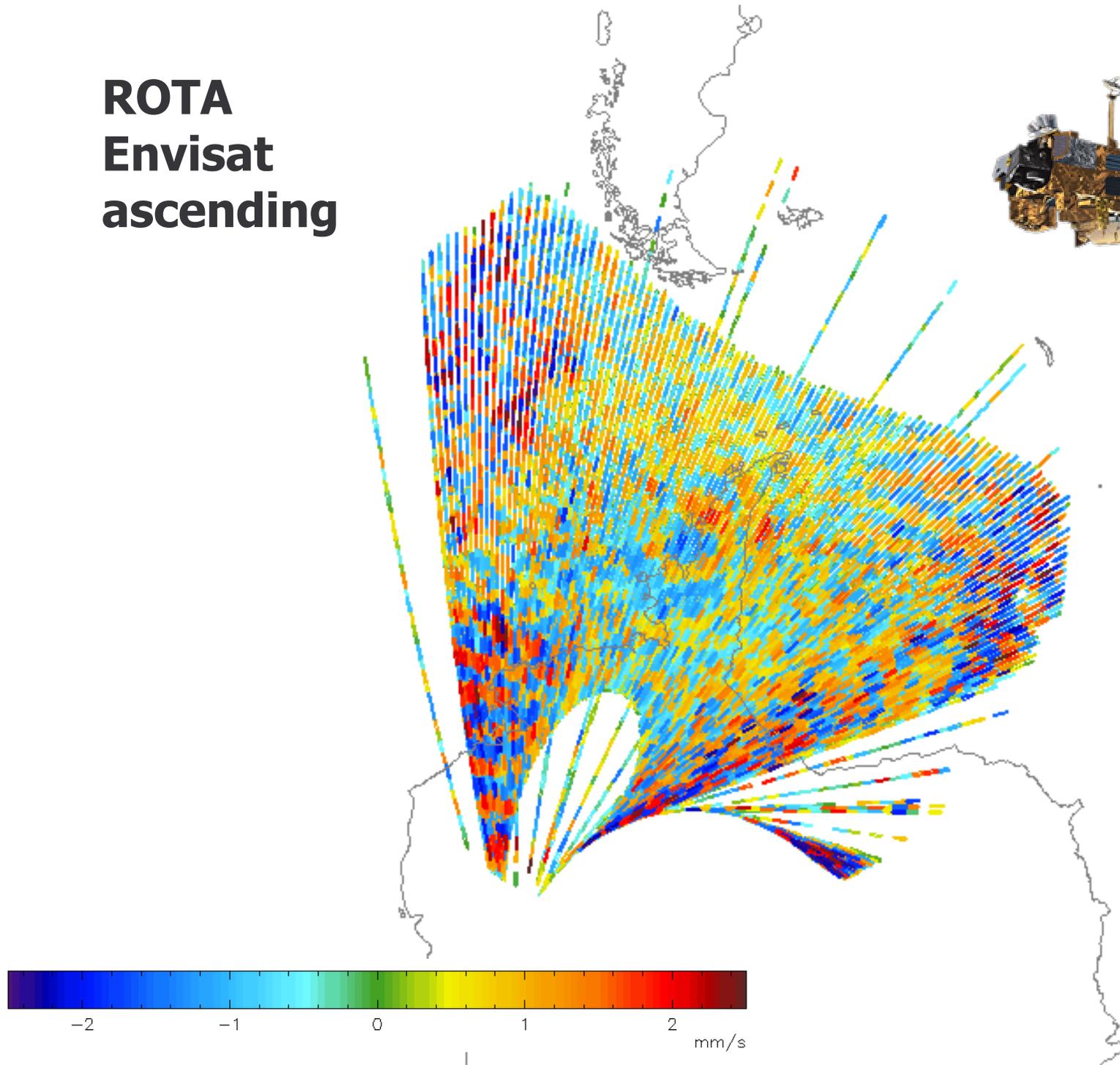
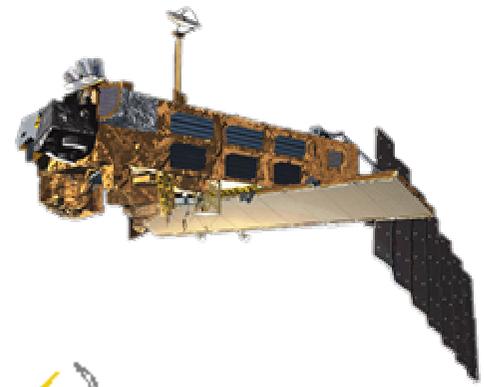
**ROTA
SPOT-5
descending**



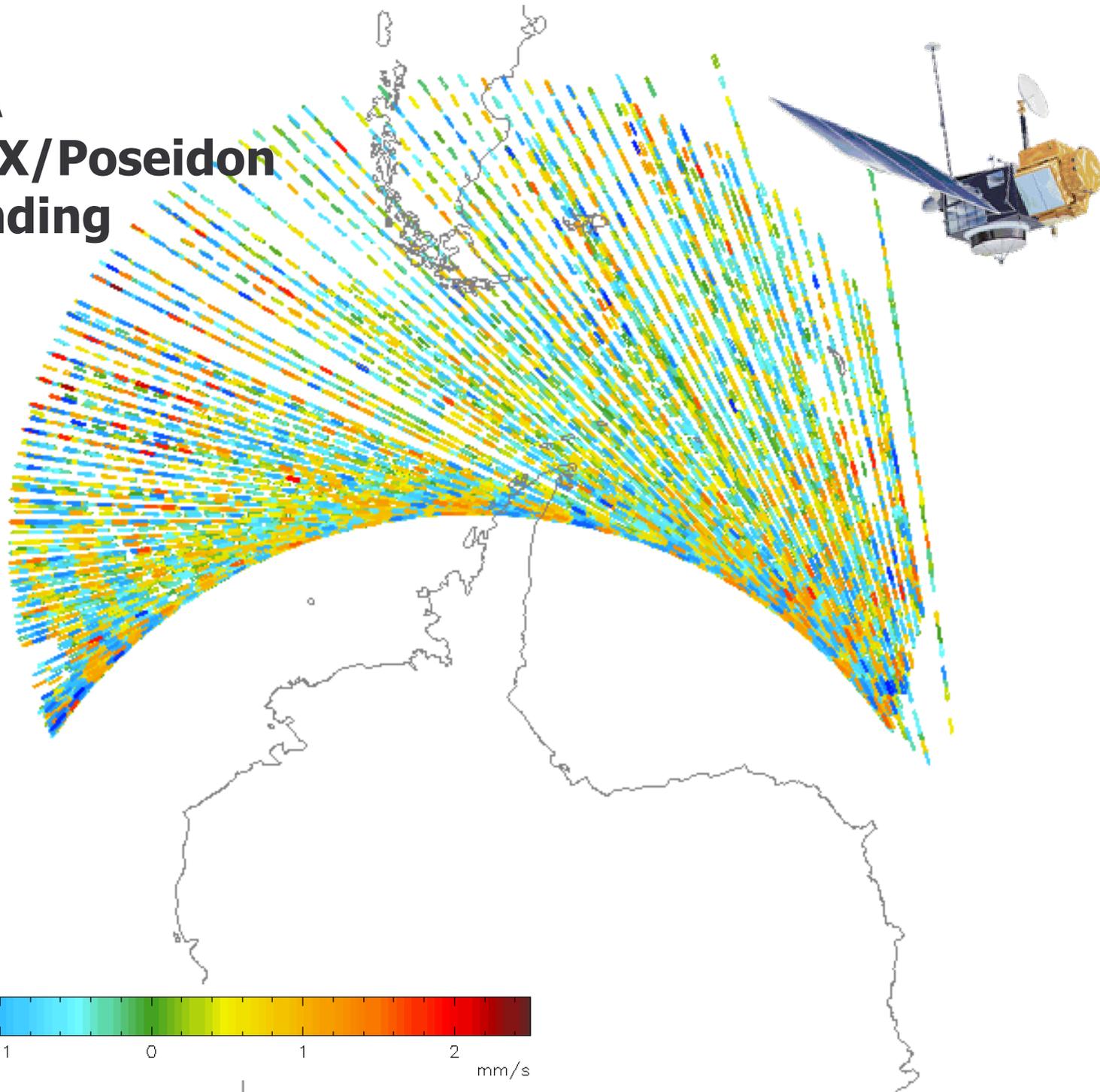
**ROTA
SPOT-5
ascending**



ROTA Envisat ascending



**ROTA
TOPEX/Poseidon
ascending**



Conclusions

- Geographic plotting of DORIS residuals provides a powerful tool for identifying possible problems
- Identification of problem source is difficult
- Possible further research:
 - Azimuth/elevation gridding of residual statistics before plotting
 - Geographic plotting of estimated bias and troposphere scale factors