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)

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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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0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55 0.6 0.65 0.7 0.75 0.8

mm/s

3
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

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

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

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

CSR

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[Map of the world with various symbols and labels, showing satellite coverage and data points for Jason-1 cycle 15.]
Envisat cycle 15 (2003/03/24 – 2003/04/28)

DEOS

[Map showing wind speeds and locations around the globe with annotations for various locations such as FUTB, CHAB, and others. The color bar indicates wind speeds ranging from 0.2 to 0.8 mm/s as of 3 May 2004.]
Envisat cycle 15 (2003/03/24 – 2003/04/28)

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

DEOS alternatives: original

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

DEOS alternatives: coordinates estimated

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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
FAIB
SPOT-4
ascending
ROTA
SPOT-5
descending

-2
-1
0
1
2
mm/s
ROTA
TOPEX/Poseidon
ascending

-2 -1 0 1 2 mm/s
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.