DORIS Simulations within Project GGOS-SIM

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Outline

- Project GGOS-SIM
- The DORIS part
  - Missions
  - Network
- DORIS orbit restitution
- Open work
- Summary
Project GGOS-SIM

- **Objectives**
  - How can the GGOS goals for the Terrestrial Reference Frame (1 mm and 0.1 mm/a) be met?
  - Simulations of the 2008 - 2014 ground networks of all space-geodetic techniques close to reality
  - Effects of technical improvements of the space-geodetic techniques on the ITRF
    - F.i. new sites
  - Impact of ties on the ITRF
    - Number and accuracy of local ties
    - Global ties (EOPs)
    - Space ties
- **Collaboration of TU Berlin and GFZ Potsdam/Oberpfaffenhofen**
- **Funded by the German Research Foundation**
  - 2 researchers for 2 and 3 years re. (September 2014 to October 2017)
Project GGOS-SIM

- Achievements so far
  - Simulations of VLBI, SLR, GPS observations
  - Combination of SLR+VLBI using local and global ties (Glaser et al., 2017, http://link.springer.com/article/10.1007/s00190-017-1021-2)
  - Combination of SLR+VLBI+GPS using local and global ties
  - Extension of the current VLBI network
The DORIS Part

The DORIS Part

- Missions selected
  - JASON-1
    - JAN 2008 – JUL 2013
    - White noise 0.035 cm/s
  - JASON-2
    - JUL 2008 – DEC 2014
    - White noise 0.035 cm/s
  - ENVISAT
    - JAN 2008 – APR 2012
    - White noise 0.042 cm/s
- # observation 67,000,000
The DORIS Part

- Sites 62
- Stations 85
DORIS Orbit Restitution

• POD starting point
  – GFZ VER11 precise orbits
    • Time variable gravity EIGEN-GRGS.RL03.v2...
    • Atmospheric loading
  – Arc length
    • Mostly driven by altimetry view on repeat cycles
      – JASON-1/-2: 10 days plus 2 days overlap
      – ENVISAT: 5 days plus 2 days overlap
      – ITRF2014: 7 days, strict
  – Integrated processing of DORIS and SLR and altimetry XO when needed

• GGOS-SIM standards
  – EIGEN-6C static
  – No atmospheric loading
DORIS Orbit Restitution

- POD: GFZ VER11 precise orbits

![Graph showing DORIS Residuals](image)
DORIS Orbit Restitution

- POD: Long arcs only, GGOS-SIM standards
DORIS Orbit Restitution

- POD: DORIS only
DORIS Orbit Restitution

- POD: Long arcs only, GGOS-SIM standards

![Graph showing LAS residuals (cm) for JASON-1, i61]
DORIS Orbit Restitution

• POD: DORIS only
Open Work

- Switch to 7-day arcs
  - According GPS weeks?
  - Fully covered with DORIS data?
- Add solve-for parameters
  - Station coordinates and velocities
  - Polar motion, ?LOD?
- Generate DORIS-only TRF
- Combine with GPS, SLR, and VLBI
Summary

- The GGOS-SIM project generated a tool to simulate the space-geodetic techniques for assessing strategies and approaches how the GGOS network goals can be met
- Realistic, representative GPS, SLR, VLBI simulations are done
- DORIS simulations are on the way