IDS DORIS RINEX Processing at the European Space Operation Centre (ESA/ESOC)

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European Space Agency

Introduction

- Modeling improvements made since last IDS Workshop

    - Status for next ITRF

- RINEX Processing implementation

- First Results

- Summary

Software and Modeling updates

preparations for next ITRF

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- NAPEOS version 4.1

- Modeling according to latest standards (IERS2010)

- A-priori coordinates ITRF-2014 (DPOD14 v2 IDS SINEX file)

- Gravityfield

    - GRGS EIGEN.GRFS.RL03.v2 (120x120) + linear drift, annual and semi annual variation up to degree and order 80)

    - C21 and S21 taken from gravityfield and no longer from mean-pole

    - awaiting latest release to become available

- Variable gravity

    - GFZ AOD1B rl06 (3 hourly, using 80x80)

- Surface force modelling

    - box re-radiation taking into account

DORIS RINEX processing

- First version of DORIS RINEX converter implemented in NAPEOS

- Testing performed with Jason-2

- One month of Jason-2 orbits and single satellite station coordinate solutions (IDS) have been generated for this presentation

- All results based on three day arcs covering the period of 25 July until 24 August 2008

- Orbits have been compared against GPS only solutions and SLR residuals have been computed for both solutions

- For the station coordinate solutions the SINEX files from the old DORIS format have been compared against the new DORIS RINEX solution as well as the internal repeatability of each solution

Jason-2 Orbit comparison

Solution	Radial	Along	Cross	Typical
DORIS (old)	5.4	18.2/12.8	19.6	15.7
RINEX (new)	6.9	16.8/-2.7	17.1	14.4
DORIS/RINEX	4.3	20.1/15.5	14.6	14.6

Jason-2 orbit comparison of old DORIS format and new RINEX format against GPS only orbit in mm (one month)

Solution	RMS	mean
DORIS (old)	15.5	+3.0
RINEX (new)	18.0	-1.5

Jason-2 one-way SLR residuals of old DORIS format and new RINEX format based orbits for test month (in mm)

Jason-2 station repeatability
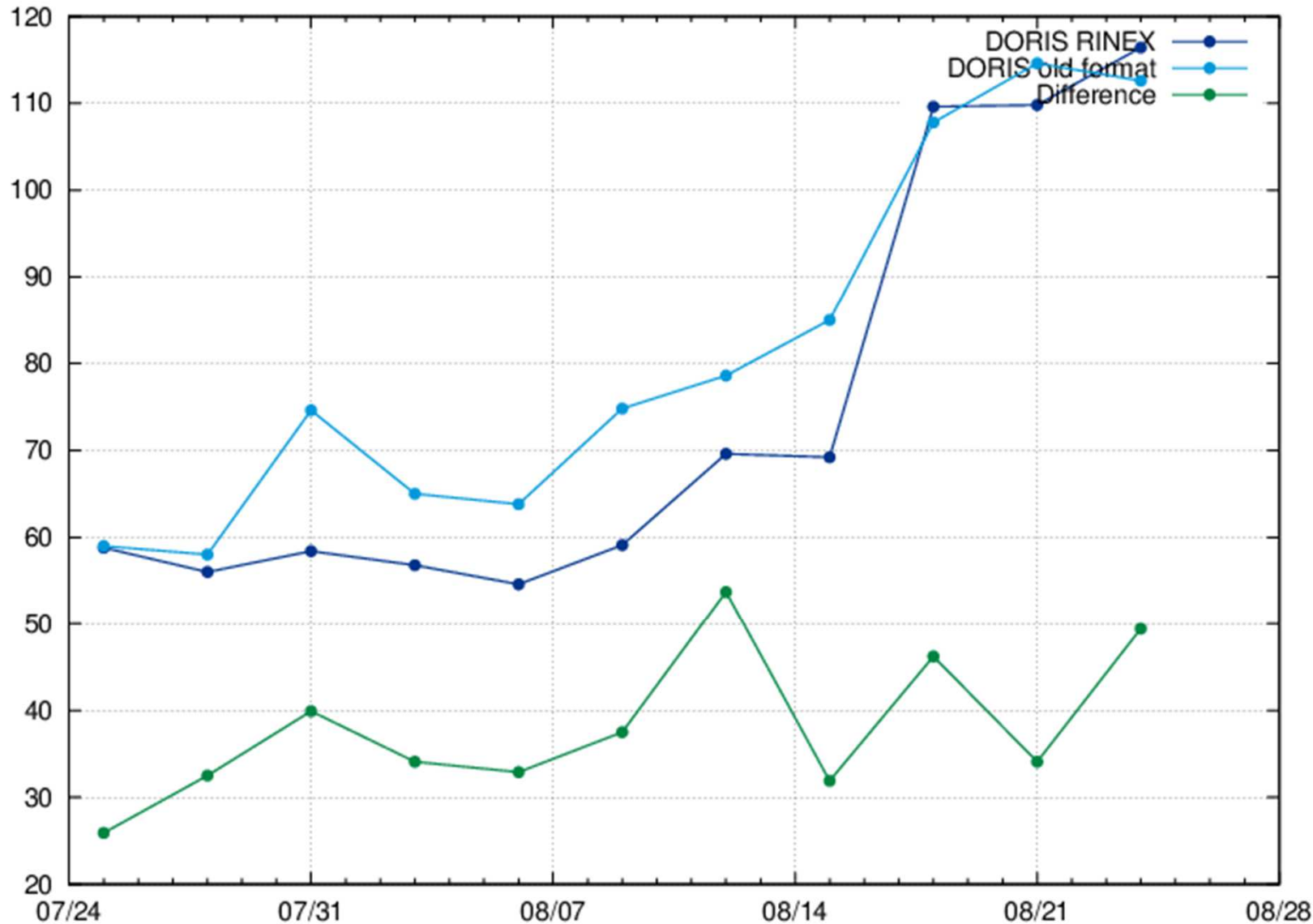
weekly repeatability – wrms (mm)

Figure on the left shows the weekly repeatability of the two SINEX solutions in (mm) after removing a helmert transformation. Larger values for last three weeks caused by the SPJB station

Jason-2 station repeatability

weekly repeatability – dx (mm)

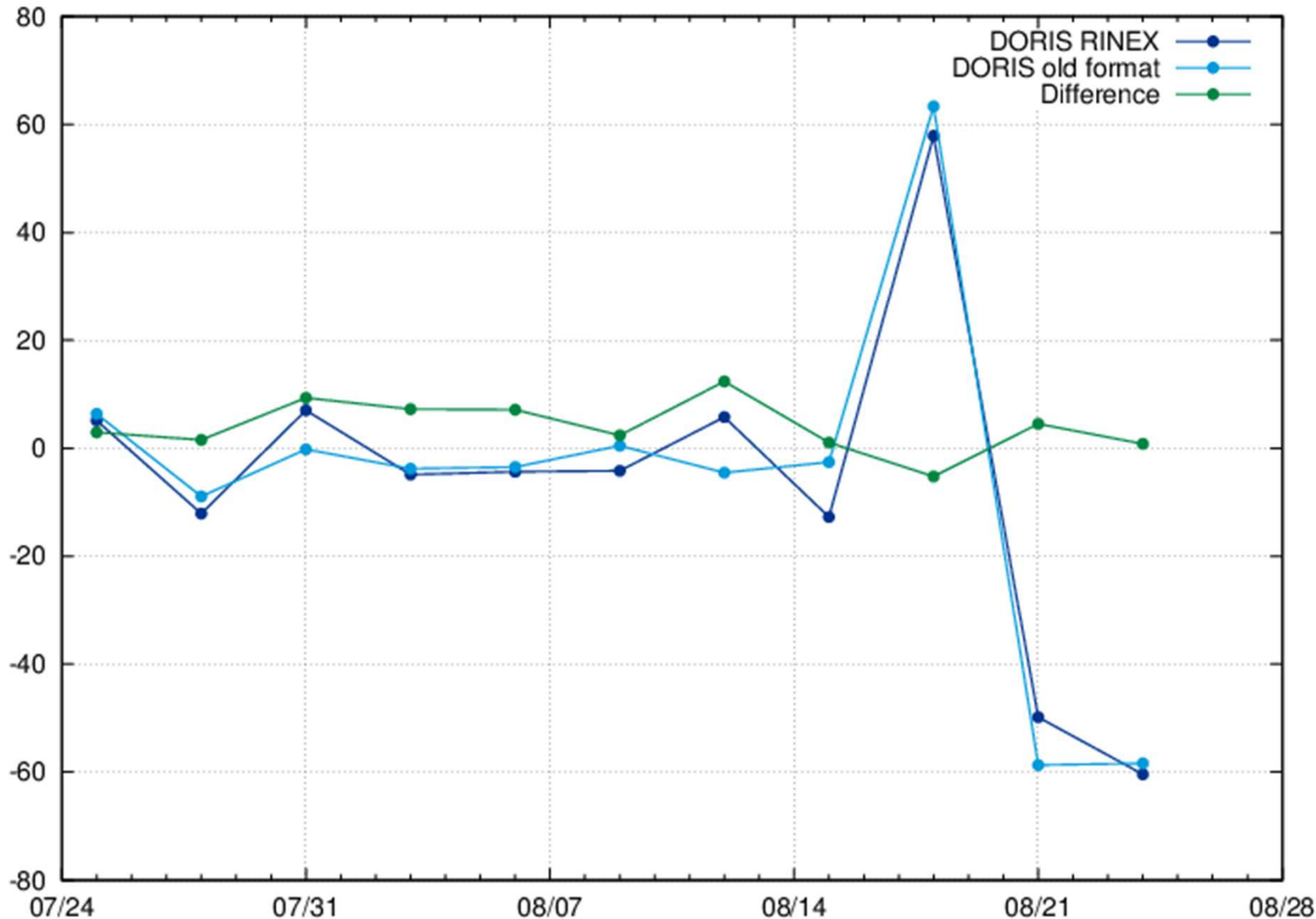Figure on the left shows the dx helmert parameter in (mm) of the two SINEX solutions. Larger values for last three weeks caused by the SPJB station

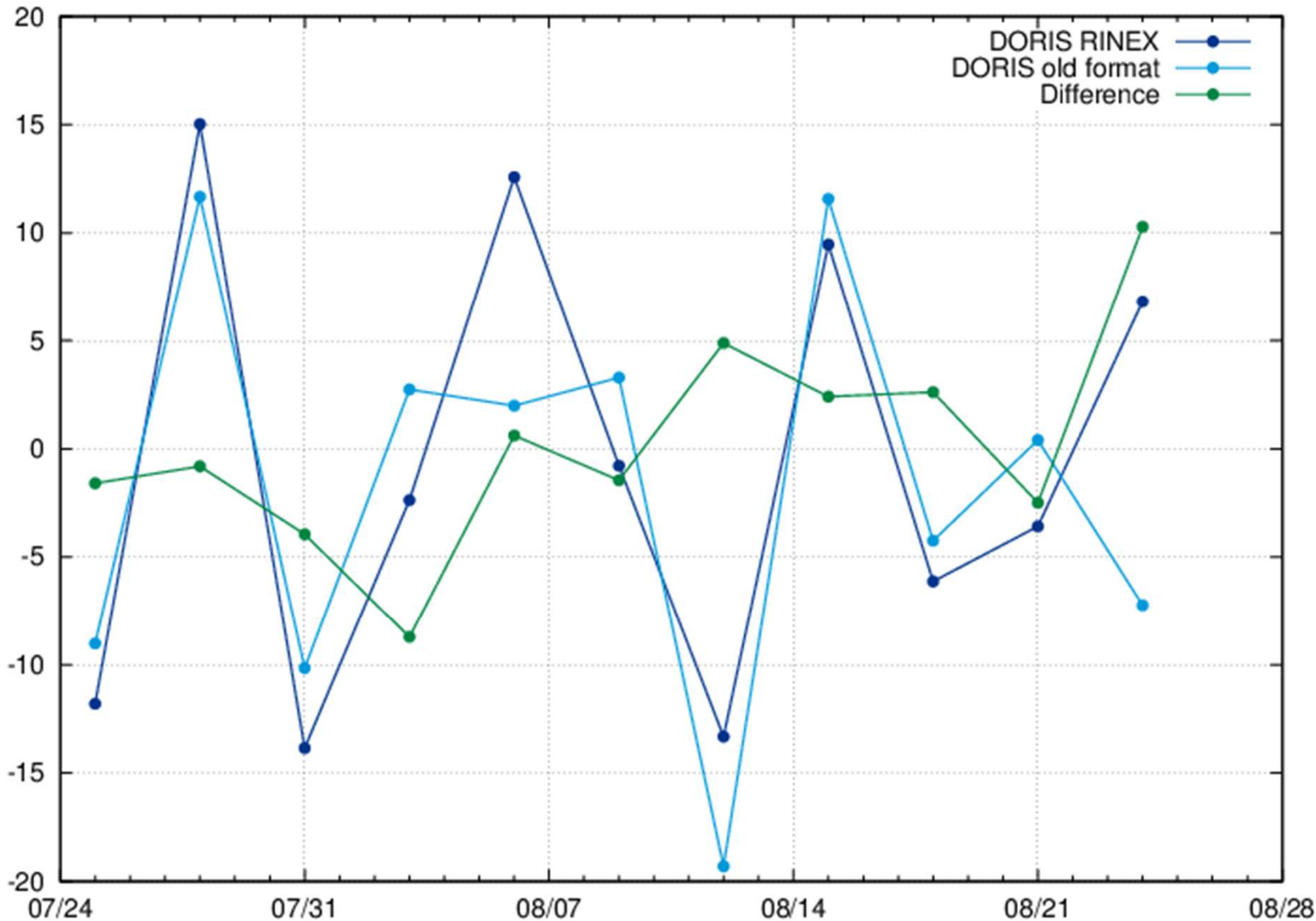# Jason-2 station repeatability

weekly repeatability – dy (mm)

Figure on the left shows the dy helmert parameter in (mm) of the two SINEX solutions. Larger values for last three weeks caused by the SPJB station

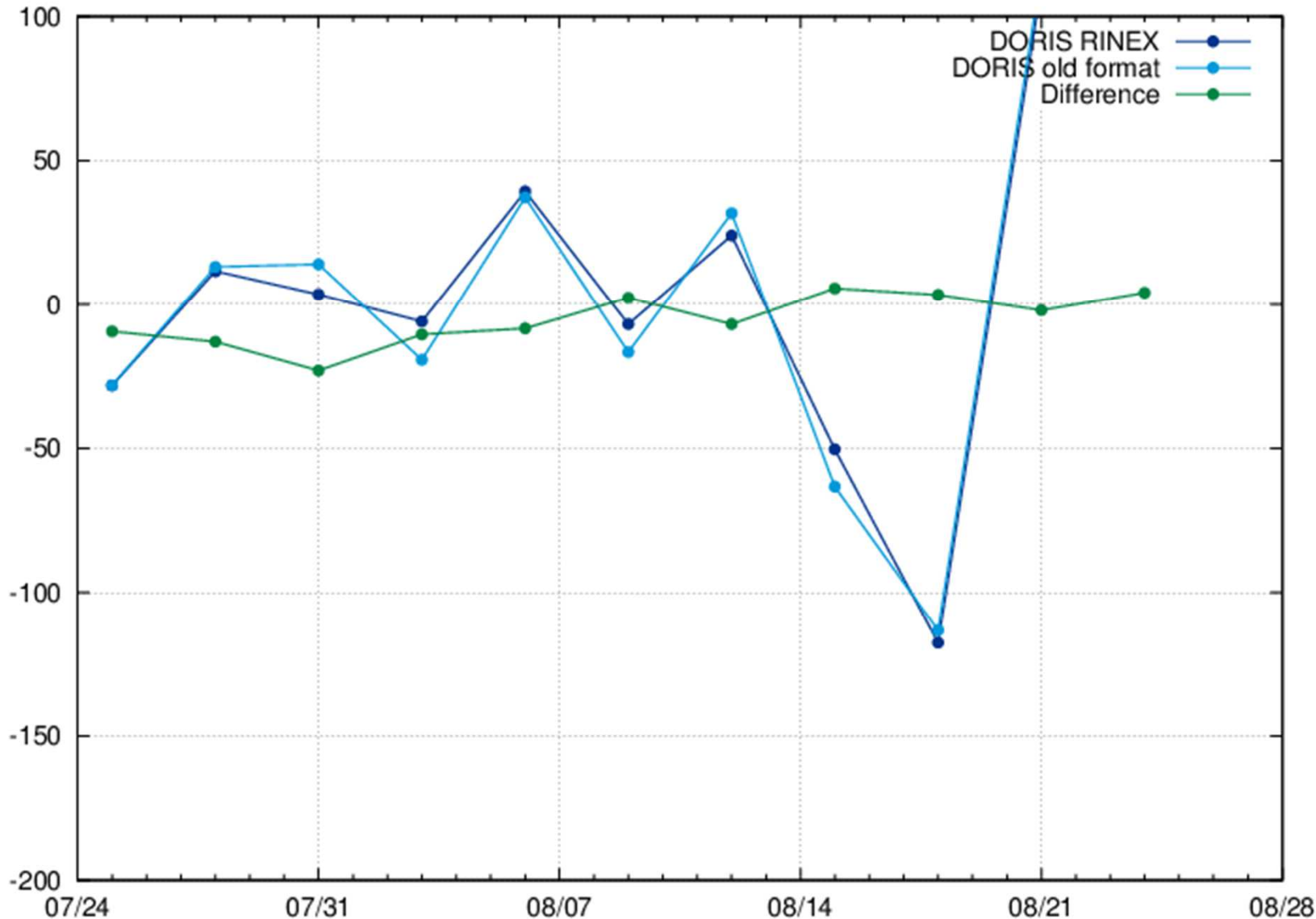# Jason-2 station repeatability

weekly repeatability – dz (mm)

Figure on the left shows the dz helmert parameter in (mm) of the two SINEX solutions. Larger values for last three weeks caused by the SPJB station

Jason-2 station repeatability
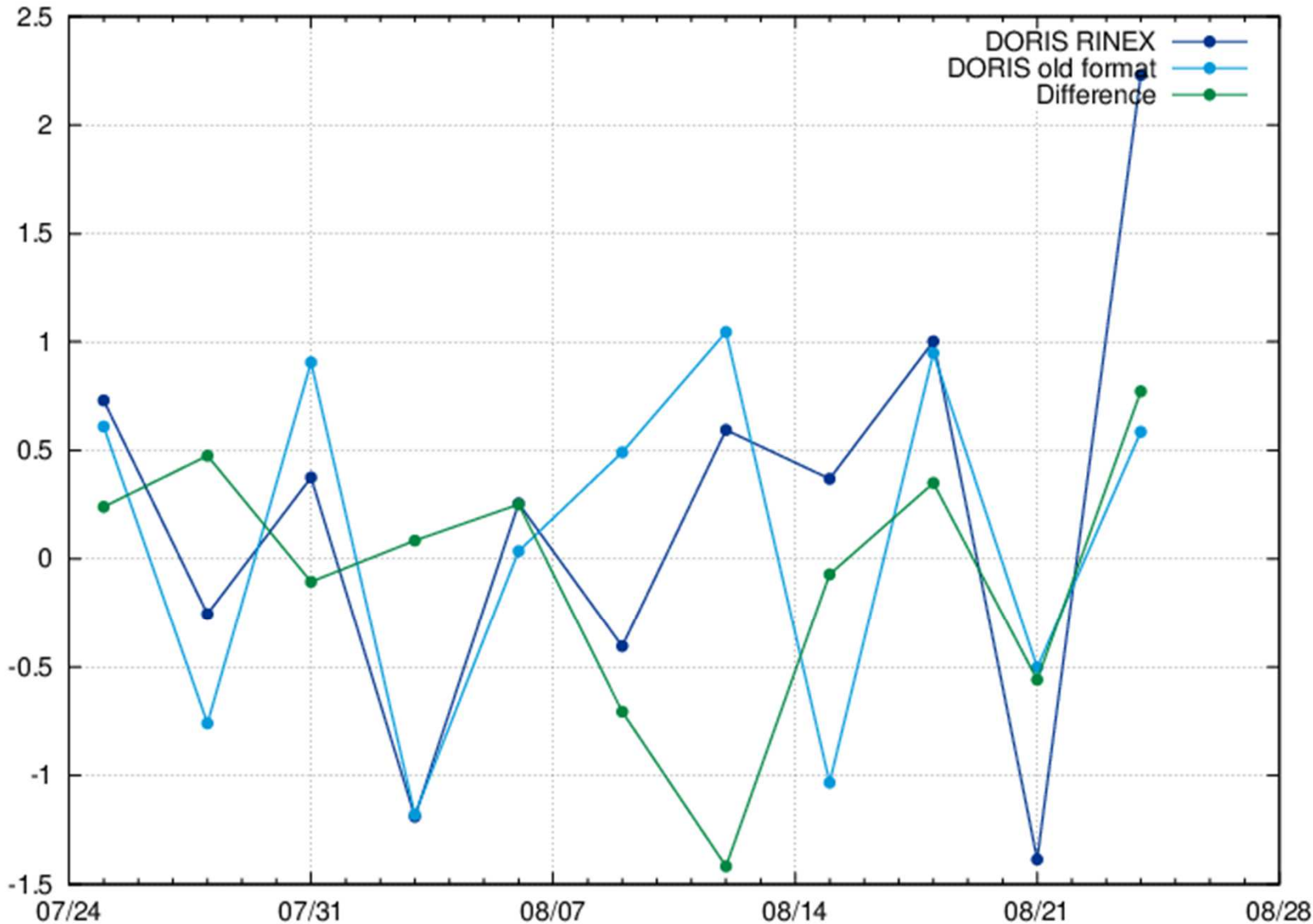
weekly repeatability – scale (ppb)

Figure on the left shows the scale helmert parameter in (ppb) of the two SINEX solutions. Larger values for last three weeks caused by the SPJB station

DORIS RINEX open points

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- Still under investigation is the (correct) application of the ionosphere correction.

- More tests will have to be performed to evaluate the current editing of the DORIS RINEX data -> we use about 10% more observation compared to the old format (we performed our own editing for the old files as well).

- Need to gain more experience with the best clock modeling to be used (currently a 4th order polynomial function is being used) -> potential cause of cross-track orbit difference.

- The current implementation of the DORIS RINEX conversion requires an a-priori orbit to exist for the satellite. Which means that for the DORIS only missions to reach the best performance two solutions have to be generated (like the CNES MOE/POE setup).

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DORIS RINEX next steps

– The next step will be to perform the same tests for a different missions this will either be Cryosat-2 or Sentinel-3A.

– After this we will generate weekly SINEX solutions using both different DORIS files for either Jason-2 or Cryosat-2 and send the SINEX files for evaluation to the IDS combination centre.

– Based on the feedback a full solution will then be generated using DORIS RINEX only files and with that restart the routine delivery of ESA solutions to the IDS.

Summary

- NAPEOS is up to date with the latest standards and no major issues foreseen with the still needed model implementations for next ITRF iteration.

- First version of DORIS RINEX conversion implemented in NAPEOS

- Initial results based on Jason-2 look good

- Further testing to be performed using a different satellite (most likely Cryosat-2 or Sentinel-3A)

- If no major issues are encountered the ESA IDS solution should become routinely available again before the end of this year.

- Based on available time a partial reprocessing is foreseen (covering the DORIS RINEX period)

Thank you

THE END

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