

Analyze of the DORIS Scale Factor and Geocenter from single satellite solutions

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Context

The DORIS scale factor and geocenter is the combination of each single DORIS satellite solutions.

Analyze the scale factor and geocenter of these single satellite solutions in order to improve the combined solution.

Previous studies showed that single satellite solutions can have some large scale or geocenter values, such as the HY-2A scale. We have already identified a high value for Tz translation for several satellites.

Determination of the single satellite solutions Comparison of each solution to DPOD2014 (computed by CATREF)





Spot-4 Scale and geocenter





Results from IDS CC (G. Moreaux)

Legend:

inawds4

gopwds4

Icawds4

gscwds4

Spot-5 Scale and geocenter

The SPOT-5-only scale clearly showed a sawtooth pattern with breaks. The discontinuities are of the order of -20 mm. Although no obvious cause has been found, efforts to understand these variations should continue, in particular to understand if something intrinsic to the SPOT-5 DORIS USO might be the cause.

2014

2010

2012

2016



Envisat Scale and geocenter





Results from IDS CC (G. Moreaux)



□ Sentinel-3A Scale and geocenter





A high bias in Tz translation ~ 6 cm



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Origin of the different offsets?

Comments:

- High Tz bias for:
 - SPOT-4 (+5 cm)
 - ENVISAT (-10 cm)
 - HY-2A (-7 cm)
 - Sentinel-3A (+6 cm)
- The Tz translation for satellite with 2 solar panels (one on each side) is not impacted

Tz bias origin

 Could be related to a wrong position in the crosstrack direction for DORIS receiver phase center (CoP) or for Center of gravity (CoG)

\rightarrow Estimation of the distance between the satellite CoG and the DORIS CoP

We start with Envisat and Sentinel-3A





Estimation of the distance between the satellite CoG and DORIS CoP

- □ Cross-track offsets
- Envisat

Component	Original value (m)	Estimated value (m)	Offset (cm)
X (cross-track)	-7.052	-7.077	-2.5
Y (along-track)	-1.085	-1.085	no
Z (radial)	-1.725	-1.725	~-0.1

Sentinel-3A

Component	Original value (m)	Estimated value (m)	Offset (cm)
X (along-track)	+1.570	+1.570	no
Y (cross-track)	+0.073	+0.093	+2
Z (radial)	+0.760	+0.760	~0.1







Impact of the use of the DORIS CoP value estimated

Processing context

 Use new cross-track value DORIS Phase center position: X=Xi – 2.5 cm for Envisat Y=Yi + 2 cm for Sentinel-3A

 Time span Processing : Envisat: from July 2008 to September 2009 Sentinel-3A: from March 2017 to December 2017

□ Impact on the obit

No significantly impact:

The orbit differences are very small in the three components DORIS RMS of fit very slightly lower

SATELLITE	Envisat	Sentinel-3A
DORIS RMS (mm/s)	0.3639 / <mark>0.3635</mark>	0.36416 / 0.36414





Impact of the use of the DORIS CoP value estimated

□ Impact on the positioning Scale Factor and Geocenter

Envisat

Sentinel-3A



when we use the CoP estimated

- The Tz bias vanishes
- Solution is more consistent with the ITRF-DPOD2014



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Impact of the use of the DORIS CoP value estimated

Impact on the positioning Single satellite Solution compared to DPOD2014 (computed by CATREF) Differences between the solution with original and estimated DORIS CoP

Station	Envisat (in cm)		Sentinel-3A (in cm)			
	North	East	Up	North	East	Up
Toulouse	0.9	0.	1.5	0.3	0.	0.5
Arequipa	0.9	0.	0.8	0.6	0.	0.9
Ny-Alesund	0.	0.	2.0	0.	0.	1.5
Rio Grande	0.3	0.	1.5	0.1	0.	1.6
Yarragadee	0.5	0.	1.9	0.4	0.	1.2
Thule	0.	0.	1.4	0.	0.	1.2

• When we use new CoP position solution is more consistent with the ITRF-DPOD2014





Perspectives

□ Same analysis to be done for the other DORIS satellites

- Other ACs and associated ACs could estimate the distance between the satellite CoG and DORIS CoP and provide their values to Analysis Coordinators
- □ To be sure that the CoG of satellite is given by taking into account the solar arrays deployed



