Impact of the low elevation measurements on the DORIS scale factor

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DORIS scale jump in 2012

Processing context

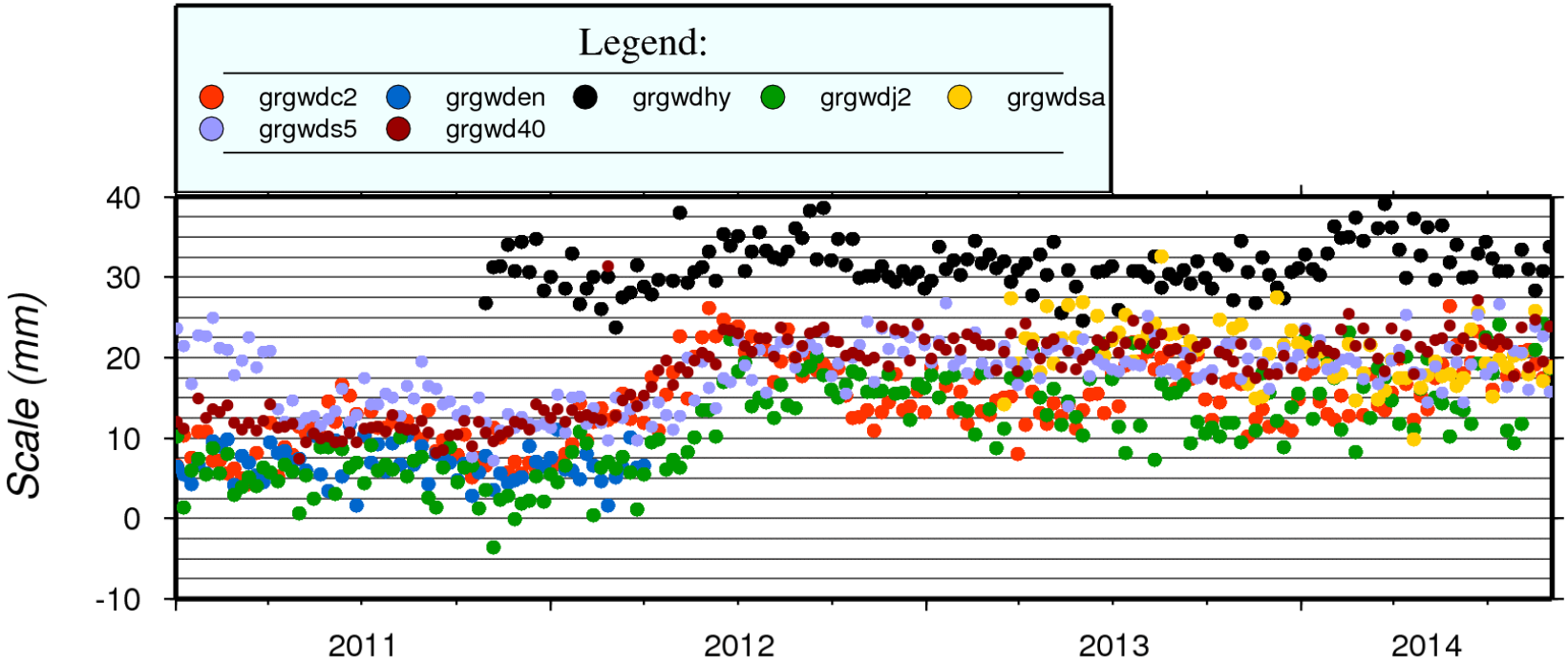
- ❑ **We analyzed DORIS data with 3.5-day arcs and a cut-off angle of 12°**

ITRF2014 configuration

All DORIS Satellites

- ❑**Single satellite and multi-satellite solutions compared to DPOD2008 (computed by CATREF)**

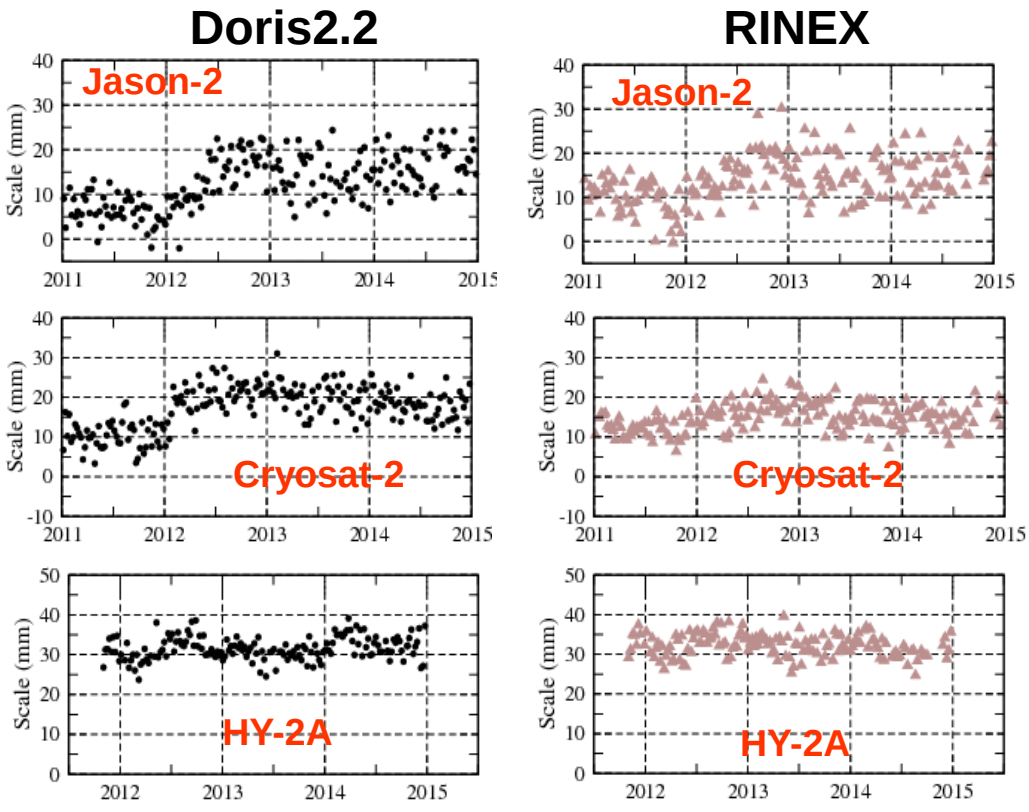
GRG scale from single satellite and multi-satellite solutions



Some DORIS Analysis Centers observe a jump in the scale factor. Then, the IDS combined solution has also the scale jump.

DORIS scale jump in 2012

GRG Scale factor for Jason-2, Cryosat-2, HY-2A solutions from Doris2.2 data and RINEX data

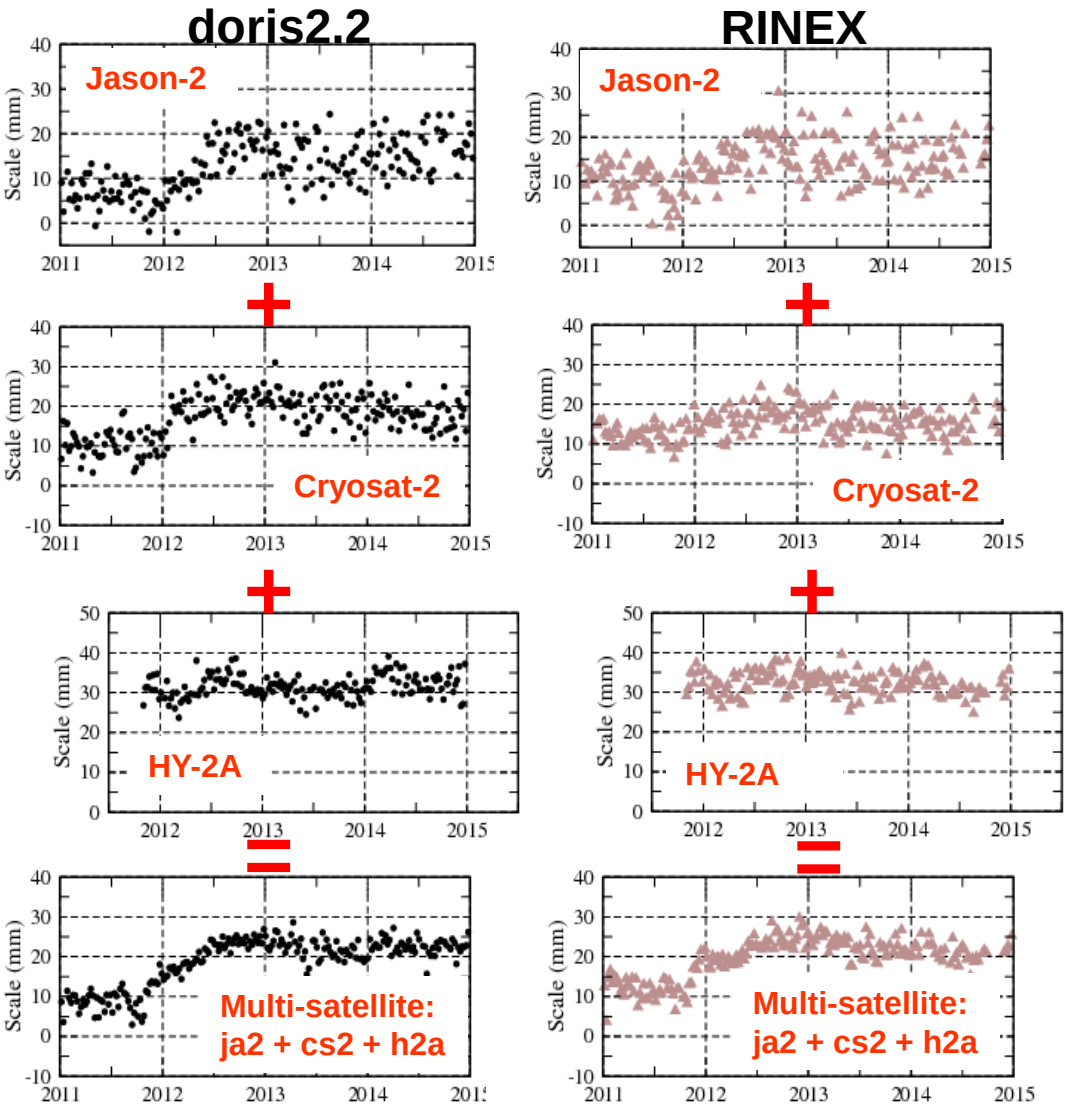


➢ **Doris2.2 data case:**
The scale factor increases for Jason-2 and Cryosat-2 solutions and not for HY-2A. HY-2A has a high scale

➢ **RINEX data case:**
no scale jump for Jason-2 and Cryosat-2 but the HY-2A scale is still high

DORIS scale jump in 2012

GRG Scale factor for Jason-2, Cryosat-2, HY-2A and the multi-satellite solutions from doris2.2 data and RINEX data



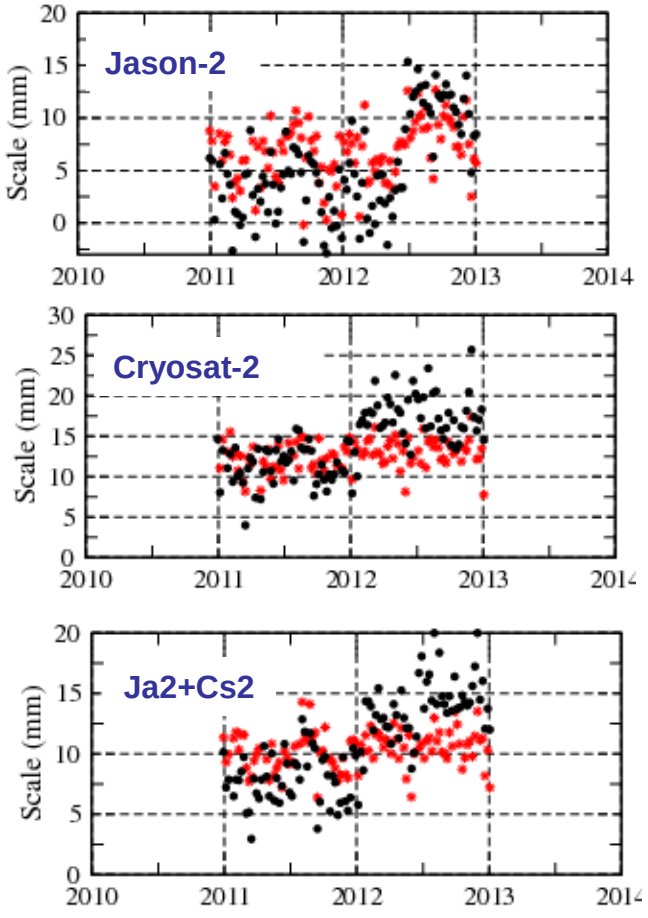
➢ **Doris2.2 data case:**
the scale increase of the multi-satellite solution is due to the jump not at the same time of the Jason-2 and Cryosat-2 solutions but also of the HY-2A high scale

➢ **RINEX data case:**
the jump observed is only due to the contribution of HY-2A

➢ **Explanation of the scale factor increase:**
for Jason-2 and Cryosat-2 that could be linked to the change of tropospheric model used by CNES in its POD processing (GDR standards):
from CNET (GDR-C) to GPT/GMF (GRD-D).

DORIS scale jump in 2012

GRG Scale factor for Jason-2, Cryosat-2 and the multi-satellite solutions from Doris2.2 data with CNES POD (in black) and GRG pre-processing (in red)



➢ **CNES POD pre-processing (in black):**
Scale jump for Jason-2 and Cryosat-2

➢ **GRG pre-processing (in red)**:
The scale jump is removed

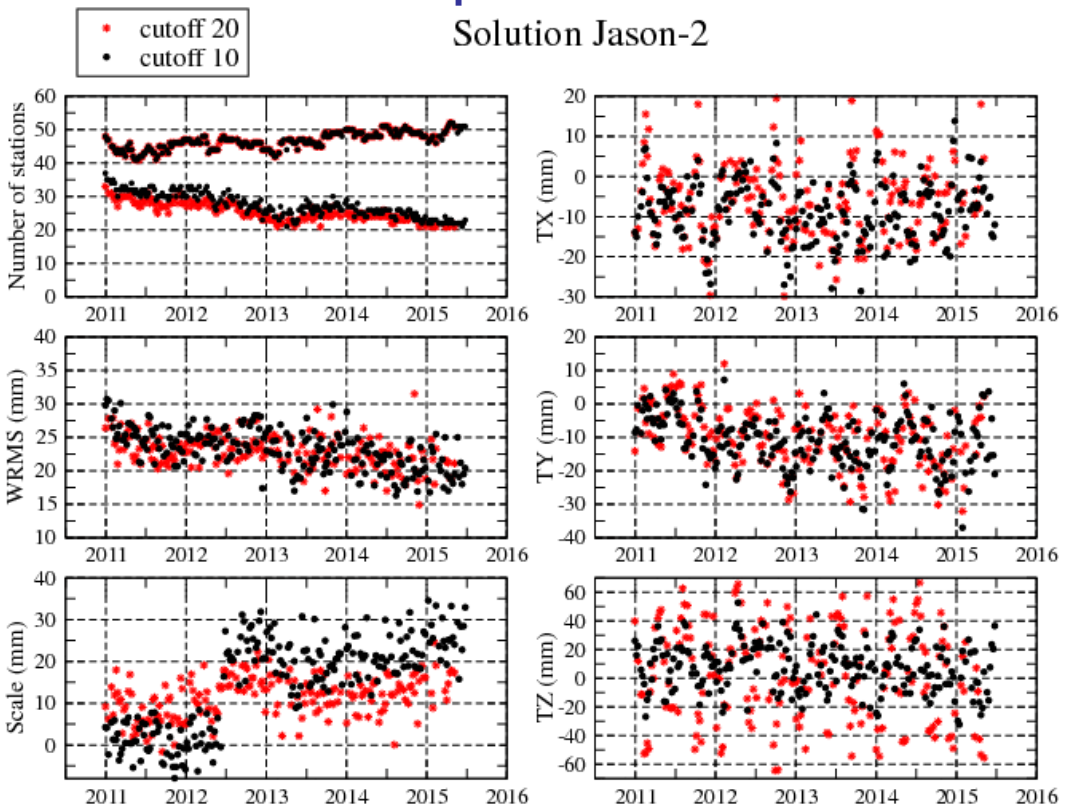
➢ **The increase of the scale factor for Jason-2 and Cryosat-2 is linked to the change of tropospheric model used by CNES in its POD processing (GDR standards): from CNET (GDR-C) to GPT/GMF (GRD-D).**
Date of change is mission dependent
reduction of the amount of data marked as rejected in the doris2.2 file. Then, an increase of the data used in GRG analysis considered to be good in CNES pre-processing. The larger number of data, especially at low elevation, can be the cause of the change we observe in the scale factor.

Then, IDS ACs need to do their own pre-processing

Impact of the cutoff angle on the DORIS scale factor

Jason-2 Single satellite Solution compared to DPOD2008 computed by CATREF
(from Jan. 2011 to Jun. 2015)
with GMF/GPT Tropospheric model
with cutoff angle of 10° and 20° (without downweighting)

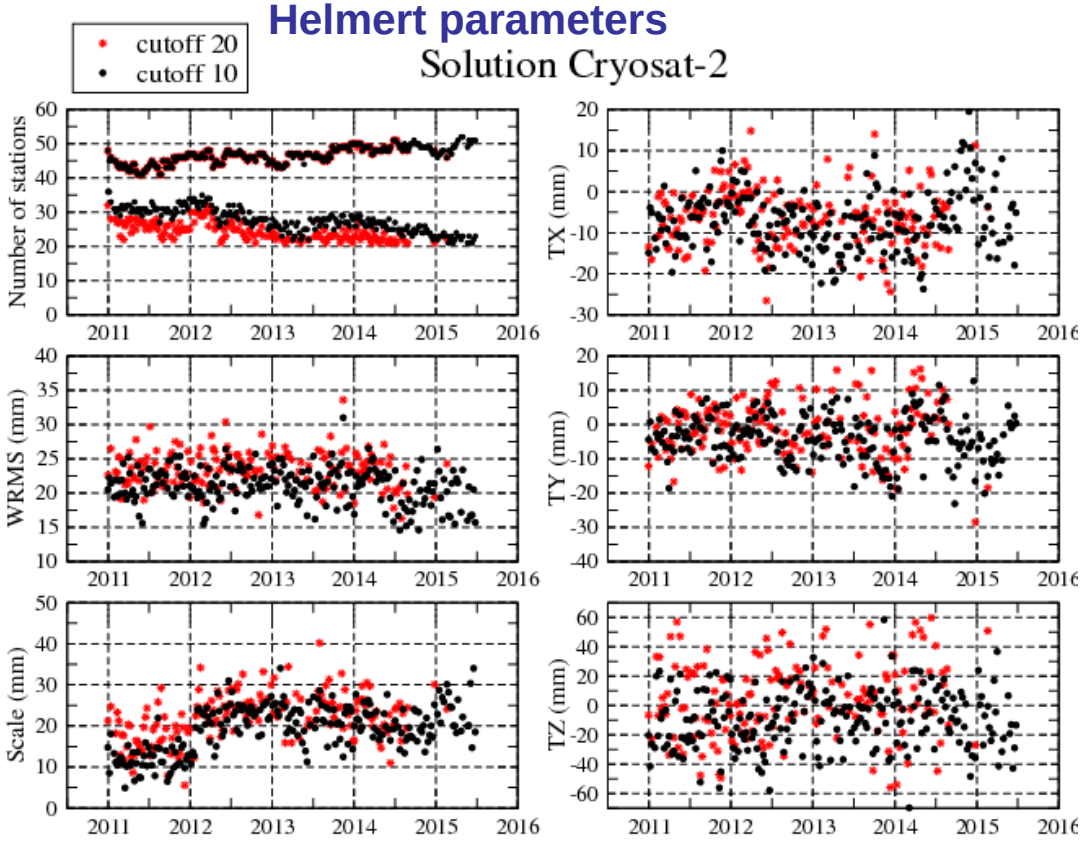
Helmert parameters



With an elevation cutoff angle of 20° the scale change in 2012 is significantly reduced
The larger number of data, especially at low elevation, is the cause of the change we observe in the scale factor for Jason-2 single-satellite solutions with the doris2.2 dataset

Impact of the cutoff angle on the DORIS scale factor

Cryosat-2 Single satellite Solution compared to DPOD2008 computed by CATREF
(from Jan. 2011 to Jun. 2015)
with GMF/GPT Tropospheric model
with cutoff angle of 10° and 20° (without downweighting)



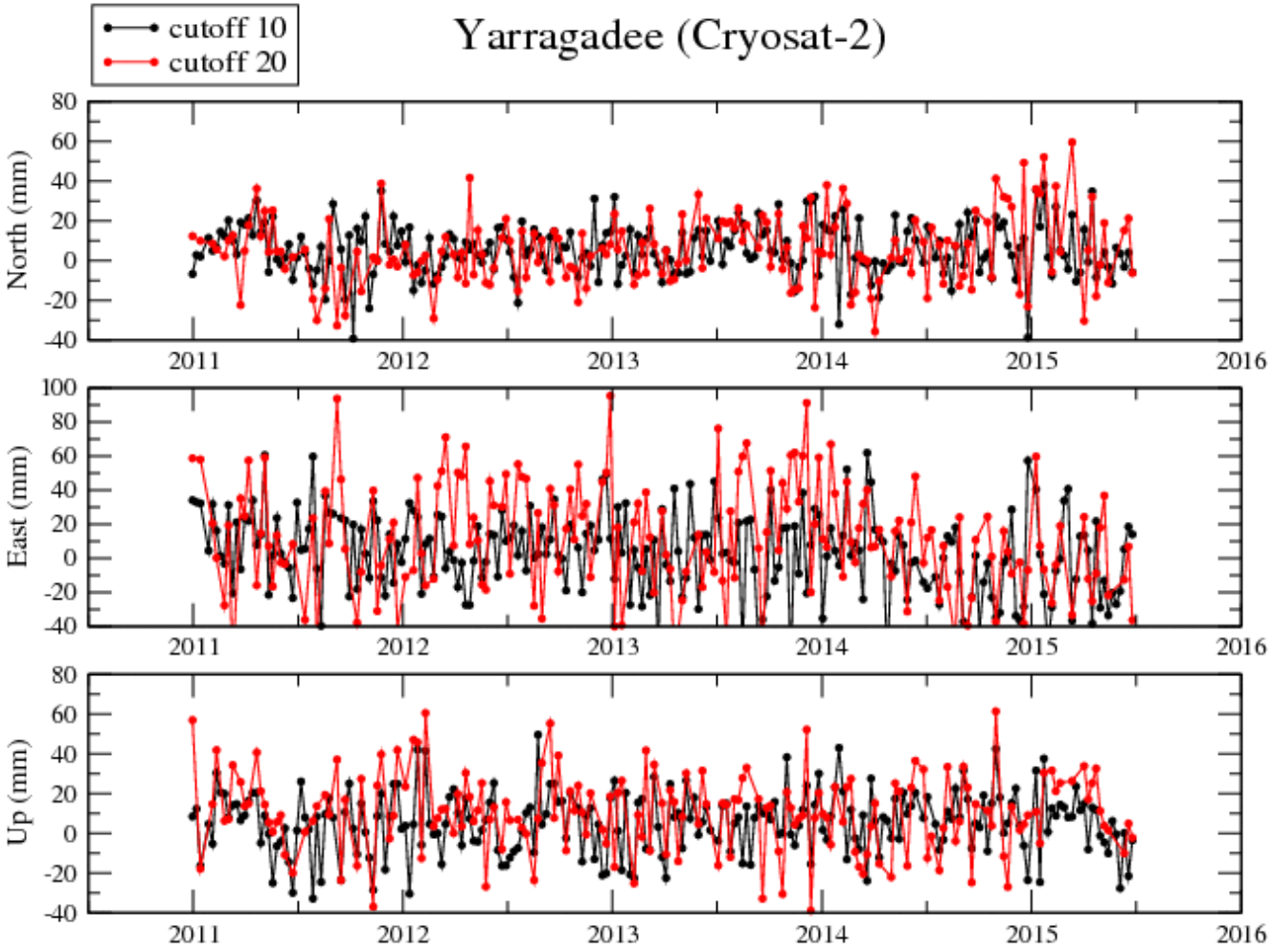
With an elevation cutoff angle of 20° the scale change in 2012 is significantly reduced
The larger number of data, especially at low elevation, is the cause of the change we observe in the scale factor for Cryosat-2 single-satellite solutions with the doris2.2 dataset

Impact of the cutoff angle on the station position estimation

Single satellite Solution compared to DPOD2008 (computed by CATREF)

weeks from Jan. 2011 to Jun. 2015

Cryosat-2 solution with cutoff angle of 10° and 20° (without downweighting)



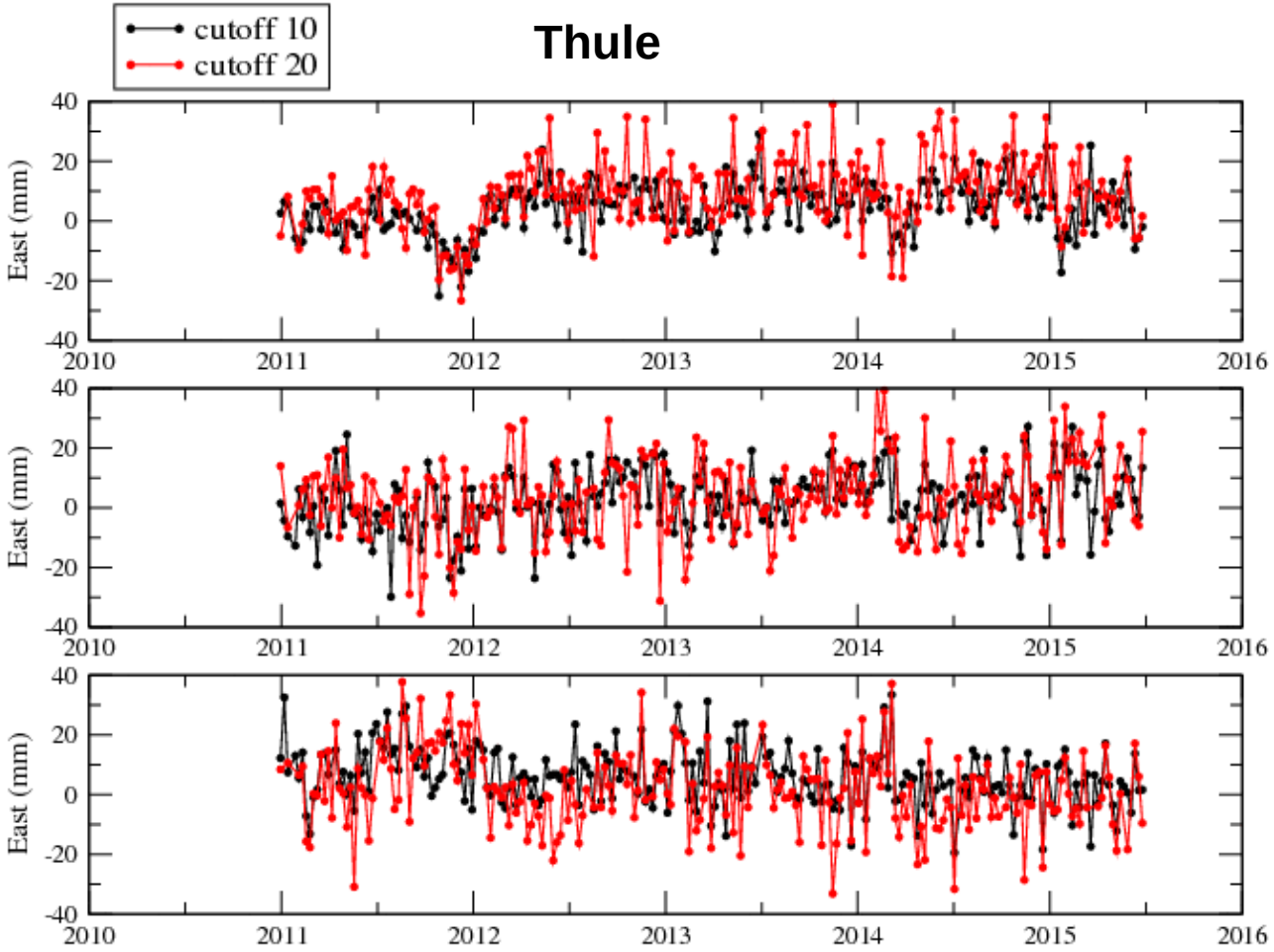
The impact of the cutoff angle is not important

Impact of the cutoff angle on the station position estimation

Single satellite Solution compared to DPOD2008 (computed by CATREF)

weeks from Jan. 2011 to Jun. 2015

Cryosat-2 solution with cutoff angle of 10° and 20° (without downweighting)



The impact of the cutoff angle is not important

Impact of the cutoff angle on the station position estimation

Single satellite Solution compared to DPOD2008 (computed by CATREF)
Differences between the Jason-2 and Cryosat-2 solutions in NEU

Mean of weeks from Jan. 2011 to Jun. 2015

Jason-2 solutions with cutoff angle of 10° and 20° (without downweighting)

Station	Jason-2 10° (in cm)			Jason-2 20°(in cm)		
	North	East	Up	North	East	Up
Cachoeira	4.5	3.2	9.6	2.6	5.4	5.5
Arequipa	-2.5	2.9	9.4	-2.6	1.7	2.9
Kourou	-3.2	0.2	2.8	-1.4	0.8	1.6
Ascension	0.5	-3.8	6.2	0.9	-3.6	4.5
Saint Helene	5.6	-0.6	3.4	4.1	-1.1	1.9
Tristan	-1.1	2.1	-2.5	-1.4	0.6	-1.6
Santiago	8.5	0.1	1.4	6.2	0.1	0.9
Libreville	-5.1	-1.2	5.0	-1.9	-1.3	1.9
Yarragadee	*0.5*	*1.6*	*0.5*	*0.1*	*1.9*	*1.4*

The cutoff angle has only an impact on the SAA stations for Jason-2 single satellite solution

CONCLUSIONS

❑ **DORIS scale jump in 2012**

The increase of the scale factor for Jason-2 and Cryosat-2 is fully explained by the change of tropospheric model used by CNES in its POD processing (GDR standards): from CNET (GDR-C) to GPT/GMF (GRD-D).

The larger number of data, especially at low elevation, is the cause of the change we observe in the scale factor.

❑ **Impact of the cutoff angle on the DORIS scale factor**

With an elevation cutoff angle of 20° the scale change in 2012 is significantly reduced
The cutoff angle, downweighting low measurements have an impact on the scale factor

❑ **Impact of the cutoff angle on the station position estimation**

The cutoff angle has an important impact on the SAA stations for Jason-2 single satellite solution