Are the Jason-2 and Jason-3 USO sensitive to the SAA?

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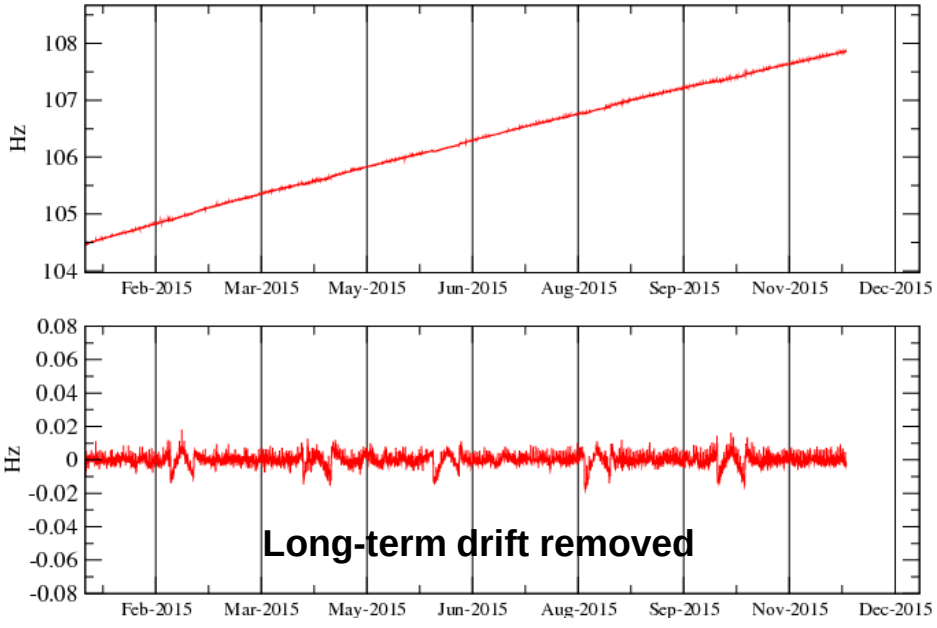
IDS AWG meeting, Delft 26-27 May 2016

Is the Jason-2 USO sensitive to the SAA?

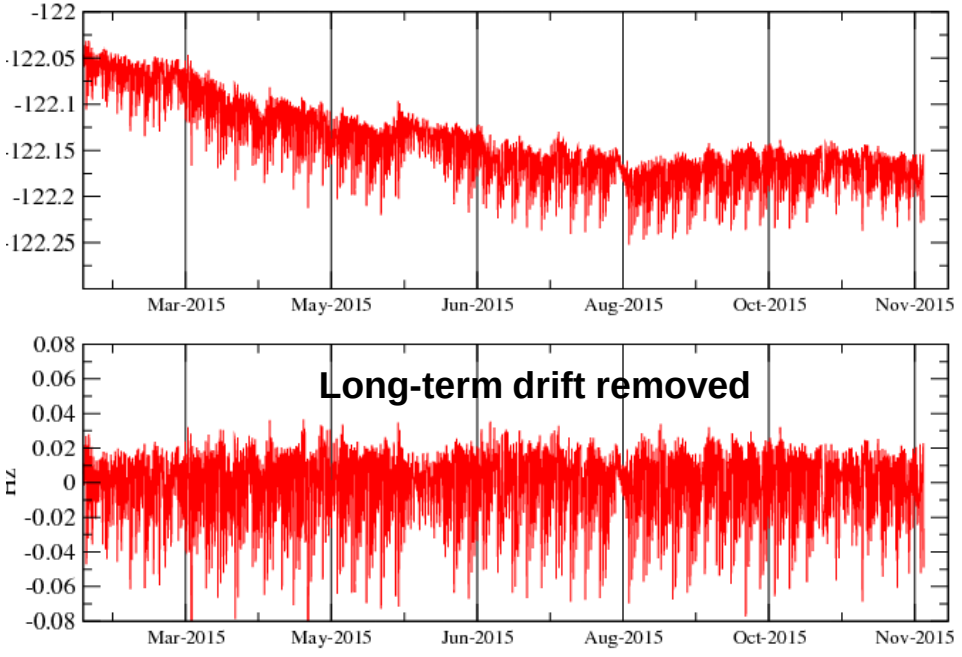
Jason-2 on board frequency estimated from CNES MOE processing

Measured drifts of the DORIS onboard oscillators with respect their nominal frequency
(on the 2GHz channel)

Jason-2



SPOT-5



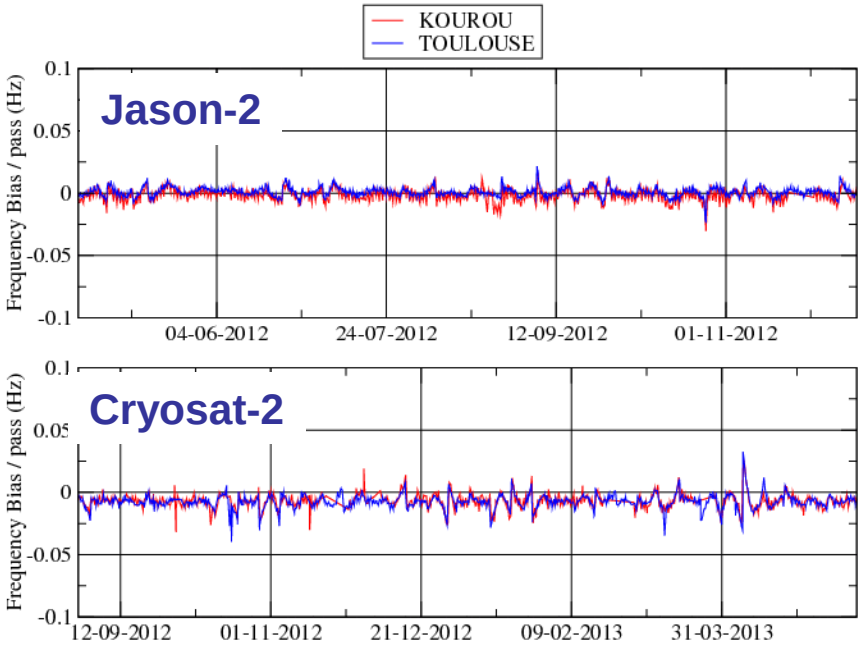
If we compare to Jason-2 result the sensitivity to SAA is 5 times stronger for SPOT-5
SAA effect on Jason-2 slightly visible in this estimation

Is the Jason-2 USO sensitive to the SAA?

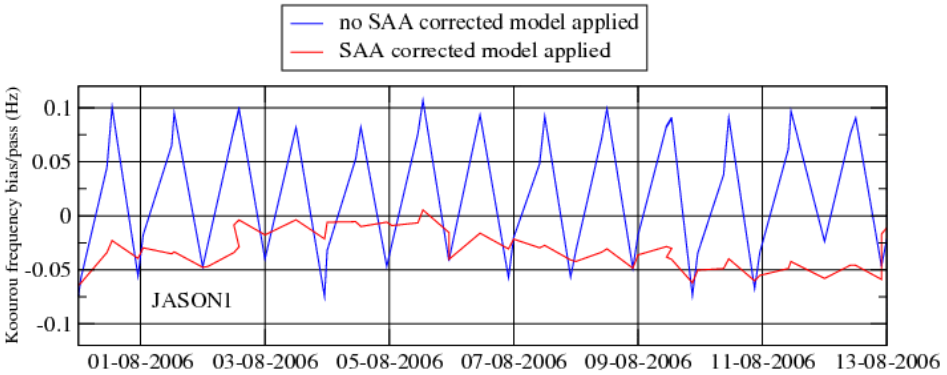
Kourou/Toulouse frequency bias/pass adjusted in GRG processing

(measurement frequency offset)

Jason-2 & Cryosat-2
Kourou and Toulouse



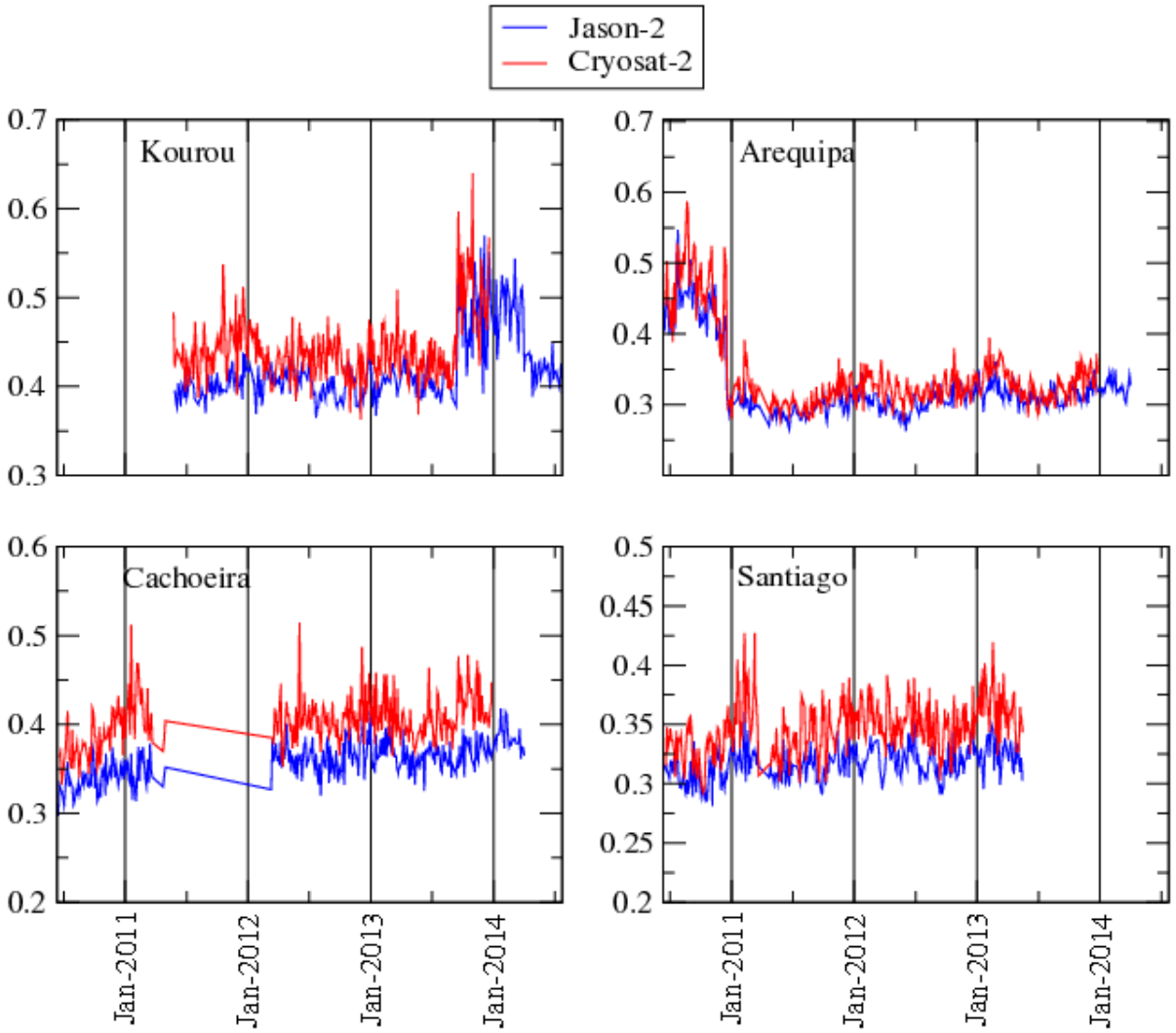
Jason-1
Kourou



If we compare to Jason-2 result, the sensitivity to SAA is:
>10 times stronger for Jason-1
SAA effect on Jason-2 not clearly visible in this estimation

Is the Jason-2 USO sensitive to the SAA?

DORIS RMS of fit (in mm/s) of SAA station from GRG processing



SAA effect on Jason-2 not visible in the DORIS RMS of fit of SAA stations

Is the Jason-2 USO sensitive to the SAA?

Single satellite Solution compared to DPOD2008 computed by CATREF

Differences between the Jason-2 and Cryosat-2 solutions in NEU

Station	North (in cm)	East (in cm)	Up (in cm)
Cachoeira [2012-2015]	4.3	3.8	8.2
Arequipa [2013-2015]	1.8	2.1	10.2
Santiago [2010-2013]	8.8	0.5	2.2
Kourou [2010]	5.1	1.1	1.2
Ascension [2011-2015]	1.8	3.5	5.2
Libreville [2011-2015]	3.1	1.1	3.4
Toulouse [2011-2015]	0.2	0.4	1.2
Thule [2011-2015]	0.6	0.8	0.3

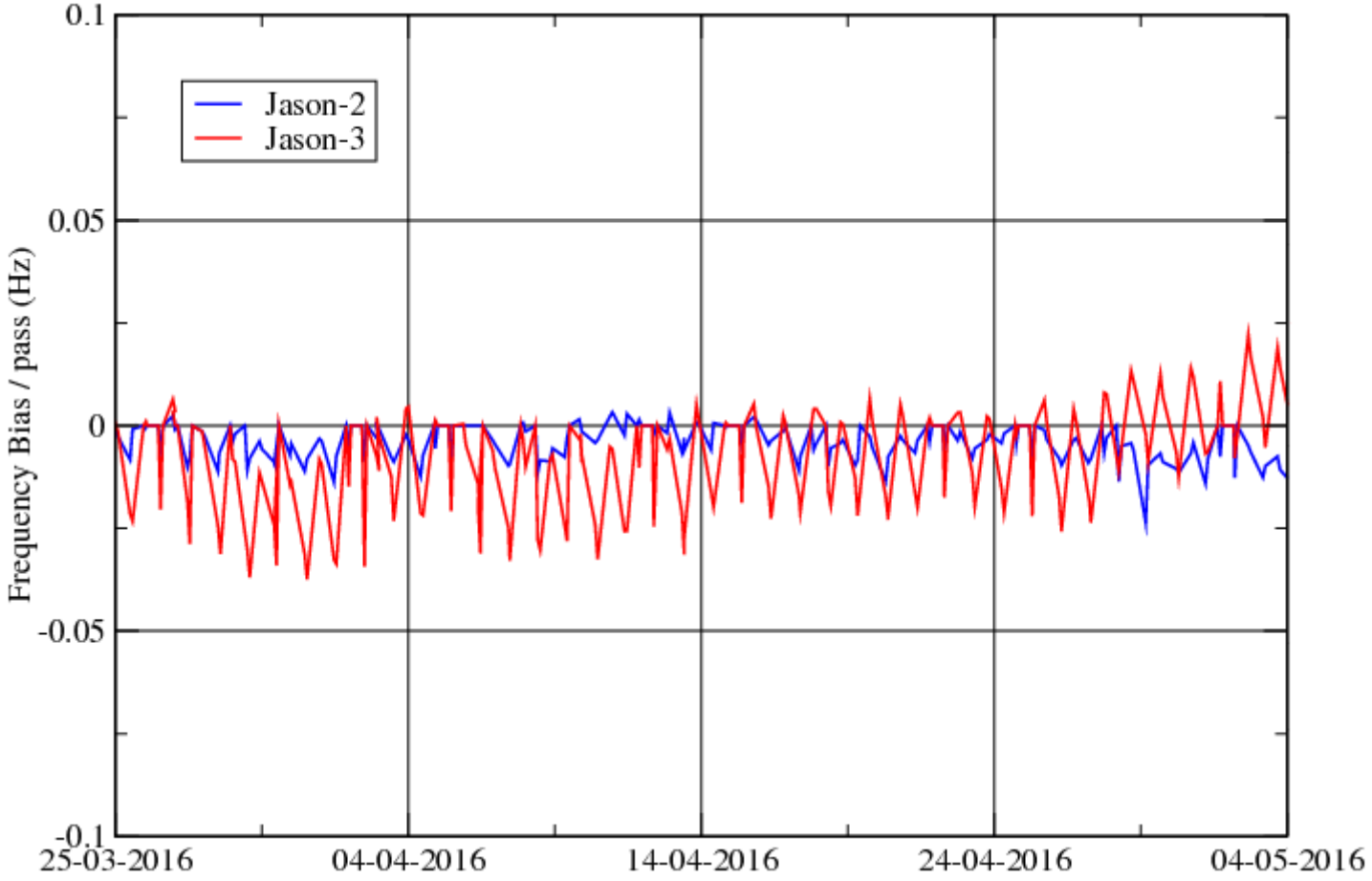
Bias in Up and/or North component for the SAA stations

Is the Jason-3 USO sensitive to the SAA?

Kourou frequency bias/pass adjusted in GRG processing

(measurement frequency offset)

Jason-2 & Jason-3



If we compare to Jason-2 result, the sensitivity to SAA is ~3 times stronger for Jason-3

Is the Jason-3 USO sensitive to the SAA?

DORIS RMS of fit (in mm/s) of SAA station from GRG processing

Mean of 11 weeks (from 21 February to 7 May 2016)

Station	Jason-2 DORIS RMS (in mm/s)	Jason-3 DORIS RMS (in mm/s)	RMS Differences (ja3-ja2)
All	**0.359**	**0.389**	**0.030**
Cachoeira	0.408	0.506	0.098
Arequipa	0.340	0.458	0.118
Kourou	0.474	0.536	0.062
Ascension	0.406	0.469	0.063
Libreville	0.379	0.440	0.061
Toulouse	0.323	0.353	0.030
Thule	0.262	0.290	0.028

DORIS RMS of fit differences between Jason-2 and Jason-3:
- are equal to 0.03 mm/s taking into account all stations
- are >0.06 mm/s for SAA stations
- are <0.03 mm/s for stations outside

Is the Jason-3 USO sensitive to the SAA?

Single satellite Solution compared to DPOD2008 computed by CATREF
Differences between the Jason-2 or Jason-3 and Cryosat-2 solutions in NEU
Mean of 11 weeks (from 21 February to 7 May 2016)

Station	North (in cm) Ja2 | Ja3	East (in cm) Ja2 | Ja3	Up (in cm) Ja2 | Ja3
Cachoeira	4.8 | 9.9	3.4 | 5.9	8.7 | 24.9
Arequipa	2.0 | 5.5	2.8 | 11.6	9.4 | 22.5
Kourou	2.9 | 9.1	0.1 | 1.8	0.9 | 5.4
Ascension	1.1 | 4.0	5.8 | 5.7	7.6 | 16.6
Libreville	3.6 | 8.4	1.4 | 1.2	3.0 | 12.2
Toulouse	0.9 | 0.9	0.8 | 0.6	0.9 | 1.8
Thule	2.8 | 2.9	0.6 | 1.6	0.6 | 0.5

For Jason-2&3: Bias in Up and/or North component for the SAA stations
Bias higher for Jason-3

CONCLUSIONS

Is the Jason-2 USO sensitive to the SAA?

• Jason-2 is sensitive to SAA but not at the same level as Jason-1 and SPOT-5
It has shown by A. Belli et al. and later on by P. Willis et al.
• The effect is not strong enough:
- to be observed clearly on the frequency board estimated by CNES MOE processing
- to be observed clearly on Kourou frequency bias/pass adjusted by GRG processing
- to be observed on the DORIS residuals of SAA station
• Jason-2 single satellite solutions show that the Jason-2 USO is affected by SAA:
Bias in Up and/or North component for the SAA stations:
Cachoeira, Santiago, Arequipa, Kourou, Ascension, Libreville, …
The multi-satellite solution provided for ITRF2014 contribution can be impacted by the Jason-2 solution for SAA stations

Is the Jason-3 USO sensitive to the SAA?

• Jason-3 is more sensitive to SAA than Jason-2
The effect is strong enough:
- to be observed clearly on the frequency board estimated by CNES MOE processing
(see presentation of C. Jayles)
- to be observed clearly on Kourou frequency bias/pass adjusted by GRG processing
- to be observed on the DORIS residuals of SAA station
• Jason-3 single satellite solutions show that the Jason-3 USO is affected by SAA:
Compared to Cryosat-2 solution, the Jason-3 solution gives a Bias in Up and/or North component for the SAA stations higher than those obtained with Jason-2 *(Cachoeira, Arequipa, Kourou, Ascension, Libreville)*

So, a data corrective model for Jason-3 is it useful ?