



POD Evaluation of 2014 TRF solutions by CNES/CLS IDS Analysis Center

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TRF2014 SOLUTIONS EVALUATION

PROCESSING CONTEXT

Impact of the position and velocity coordinates of the DORIS stations from DPOD2008 (DPOD2008 v1.14), ITRF2014, DTRF2014 and JTRF2014

Orbits computed:

- DORIS TOPEX orbits (January 1993 to July 2004)
- DORIS Jason-1 orbits (July 2004 to October 2008)
- DORIS Jason-2 orbits (October 2008 to December 2014)

Evaluation of DORIS POST-FIT RMS RESIDUALS and orbit comparison / DPOD2008

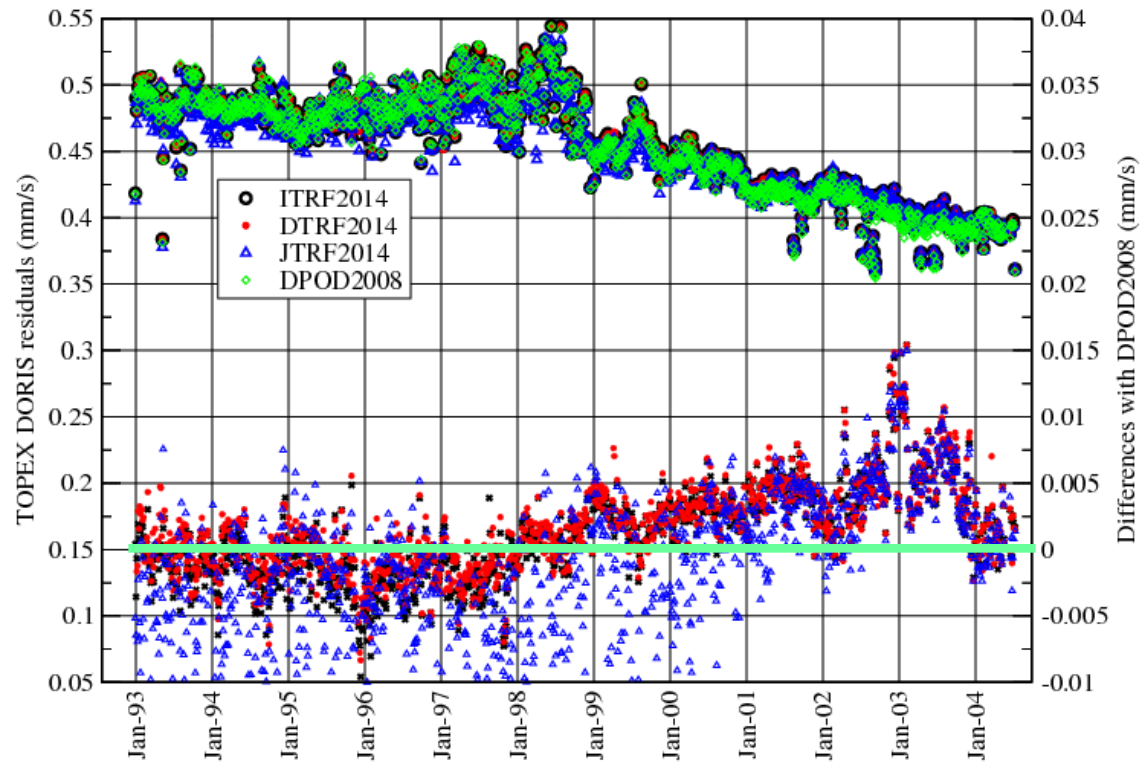
- DORIS post-fit residuals global and per station
- DORIS-only orbit independent SLR RMS residuals
- RMS of radial differences between TRF2014 and DPOD2008
- Mean of Z orbit differences between TRF2014 and DPOD2008

TRF2014 EVALUATION ON TOPEX POD

TOPEX DORIS post-fit residuals from DPOD2008 and TRF2014 solutions and differences with DPOD2008

(DORIS data from Jan. 1993 to Jul. 2004)

Solutions	DORIS stations Number	DORIS points	DORIS RMS residuals (mm/s)
DPOD2008	39.8	19339	0.454
ITRF2014	39.8	18718	0.455
DTRF2014	39.8	18765	0.456
JTRF2014	35.3	17226	0.452



Negative => improvement for TRF2014

Very small differences

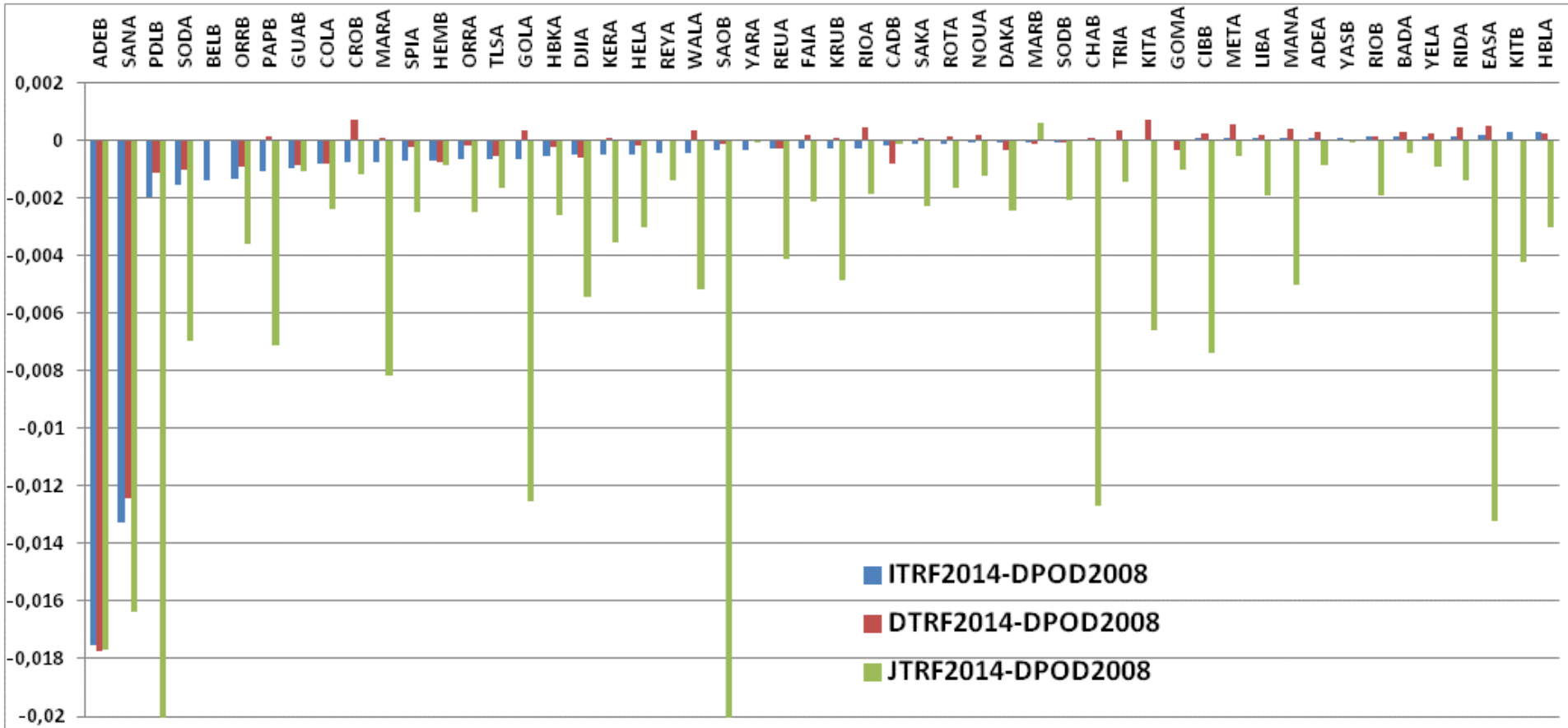
Two periods for TOPEX:

- from 1993 to 1998 improvement with the 3 TRF2014 (JTRF better solution but less stations)*
- from 1999 to mid-2004 degradation with all new TRF*

TRF2014 EVALUATION ON TOPEX POD

TOPEX DORIS post-fit residuals differences (TFR2014-DPOD2008)

(DORIS data from Jan. 1993 to Jul. 2004)



Negative => improvement for TRF2014

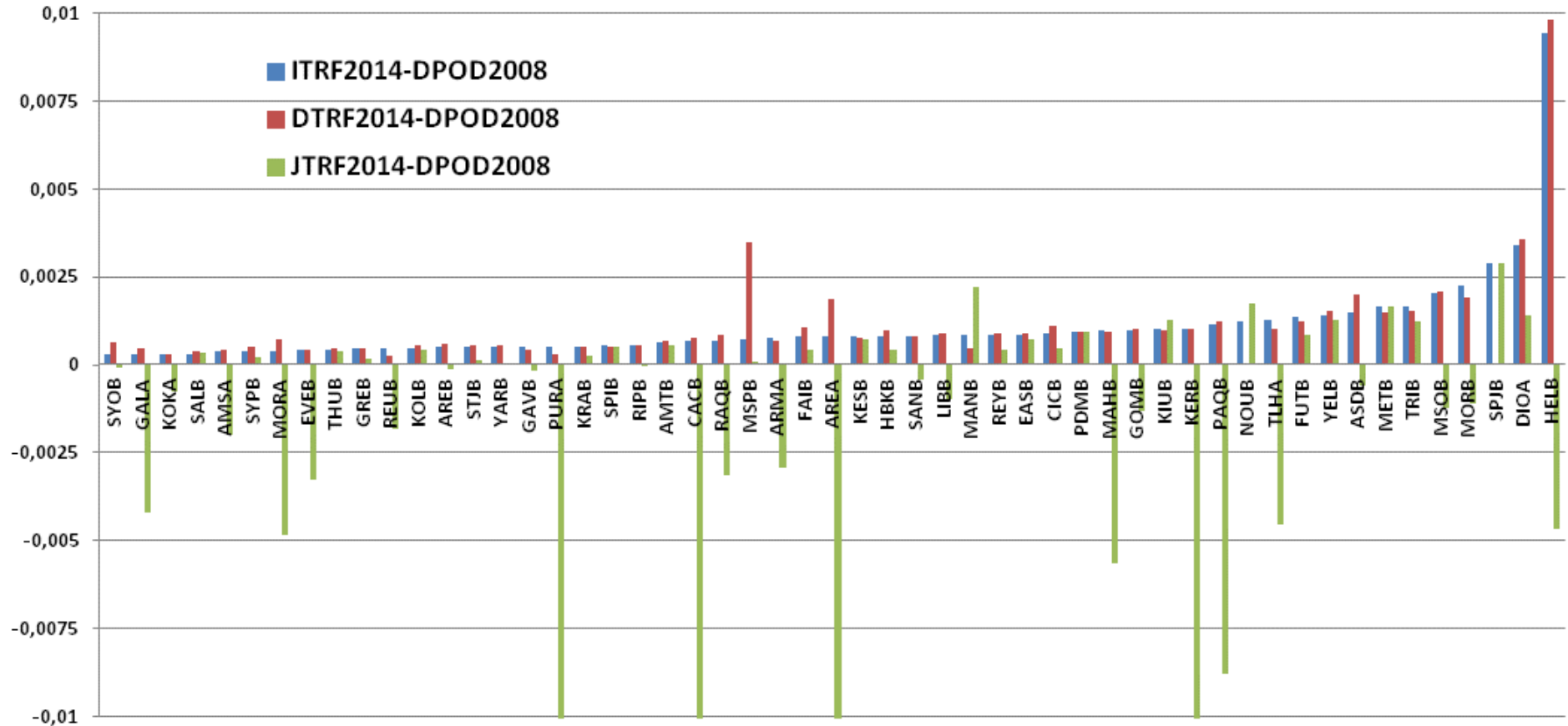
Very small differences

For these stations clear improvement with JTRF2014

Significant improvement for ADEB for all the TRF2014s (no discontinuity change)

TRF2014 EVALUATION ON TOPEX POD

TOPEX DORIS post-fit residuals differences (TFR2014-DPOD2008)
(DORIS data from Jan. 1993 to Jul. 2004)



Negative => improvement for TRF2014

Very small differences

For these stations degradation with TRF2014 except for JTRF2014

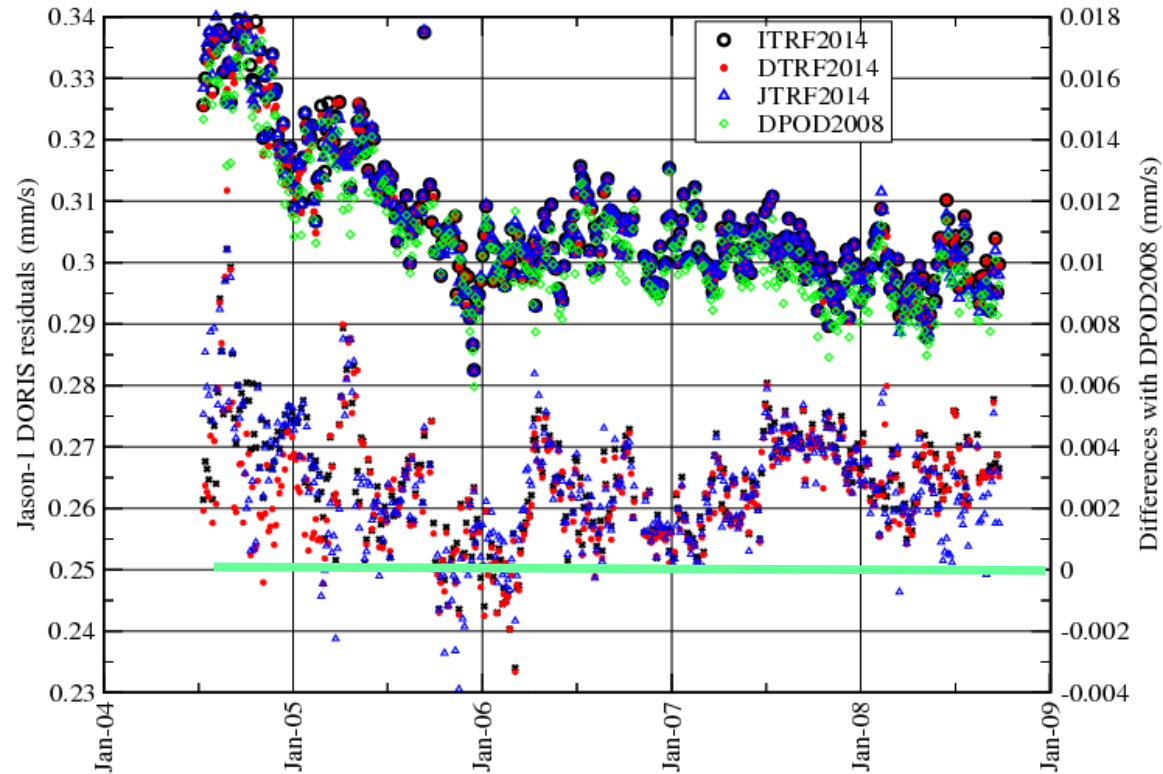
Stronger degradation for HELB (no discontinuity change in ITRF2014)

TRF2014 EVALUATION ON JASON-1 POD

Jason-1 DORIS post-fit residuals from DPOD2008 and TRF2014 solutions and differences with DPOD2008

(DORIS data from Jul. 2004 to Oct. 2008)

DPOD Solutions	DORIS stations Number	DORIS points	DORIS RMS residuals (mm/s)
DPOD2008	43.9	36952	0.304
ITRF2014	43.9	36270	0.307
DTRF2014	43.8	36106	0.307
JTRF2014	43.2	35913	0.307



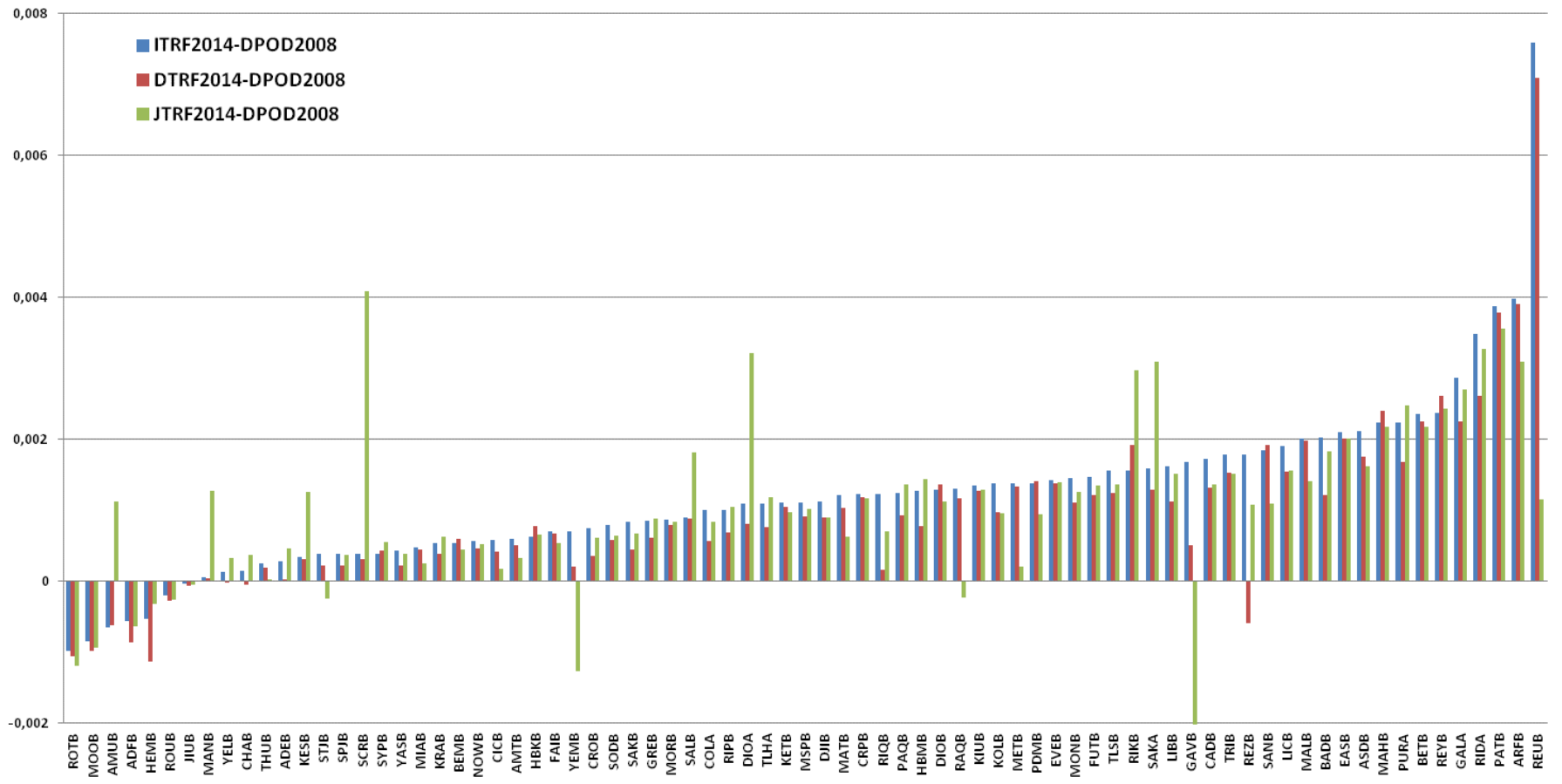
Negative => improvement for TRF2014

Very small differences

For Jason-1 degradation for all TRF2014 from mid-2004 to 2008 but less measurements compared to DPOD2008

DPOD2014 EVALUATION ON JASON-1 POD

Jason-1 DORIS post-fit residuals differences (TFR2014-DPOD2008)
(DORIS data from Jul. 2004 to Oct. 2008)



Negative => improvement for TRF2014

Very small differences

For Jason-1 degradation for all TRF2014 from mid-2004 to 2008 except for ~6 stations

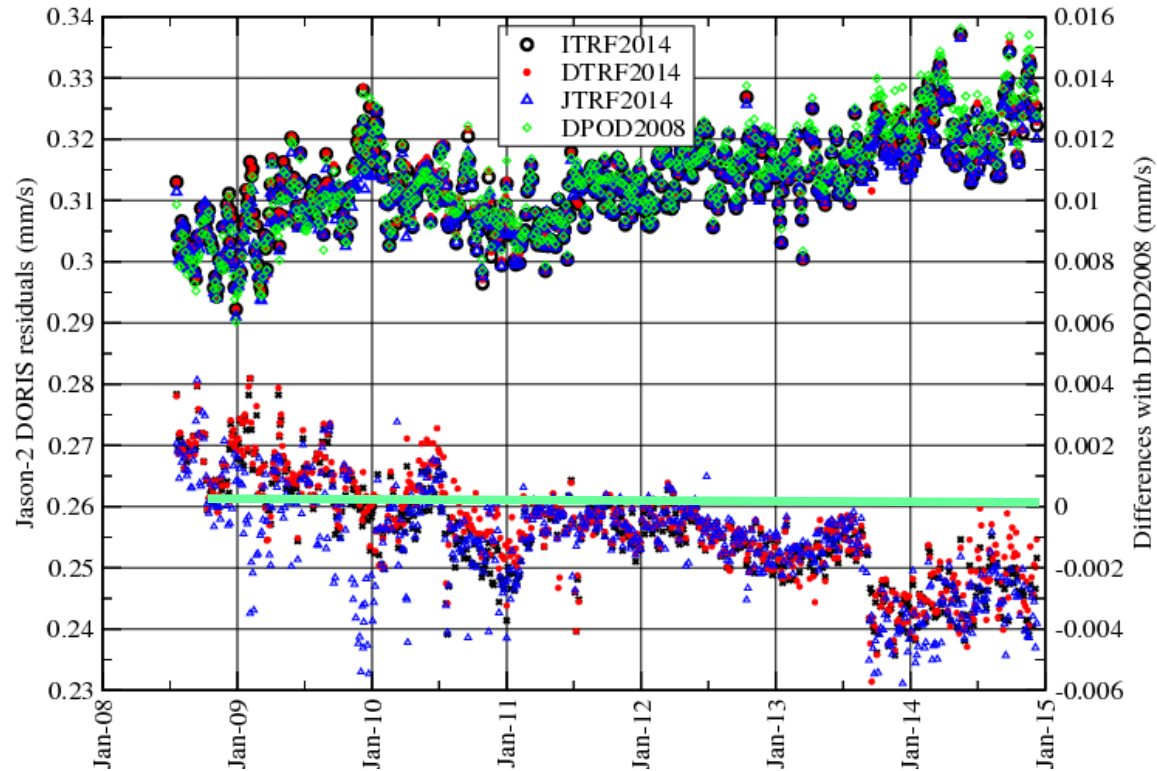
Stronger degradation for REUB with DTRF2014, ITRF2014 (consequence of discontinuity differences ?)

TRF2014 EVALUATION ON JASON-2 POD

Jason-2 DORIS post-fit residuals from DPOD2008 and TRF2014 solutions and differences with DPOD2008

(DORIS data from Oct. 2008 to Dec. 2014)

DPOD Solutions	DORIS stations Number	DORIS points	DORIS RMS residuals (mm/s)
DPOD2008	46.3	52038	0.314
ITRF2014	46.3	50934	0.313
DTRF2014	45.9	50498	0.313
JTRF2014	45.7	50458	0.312



Negative => improvement for TRF2014

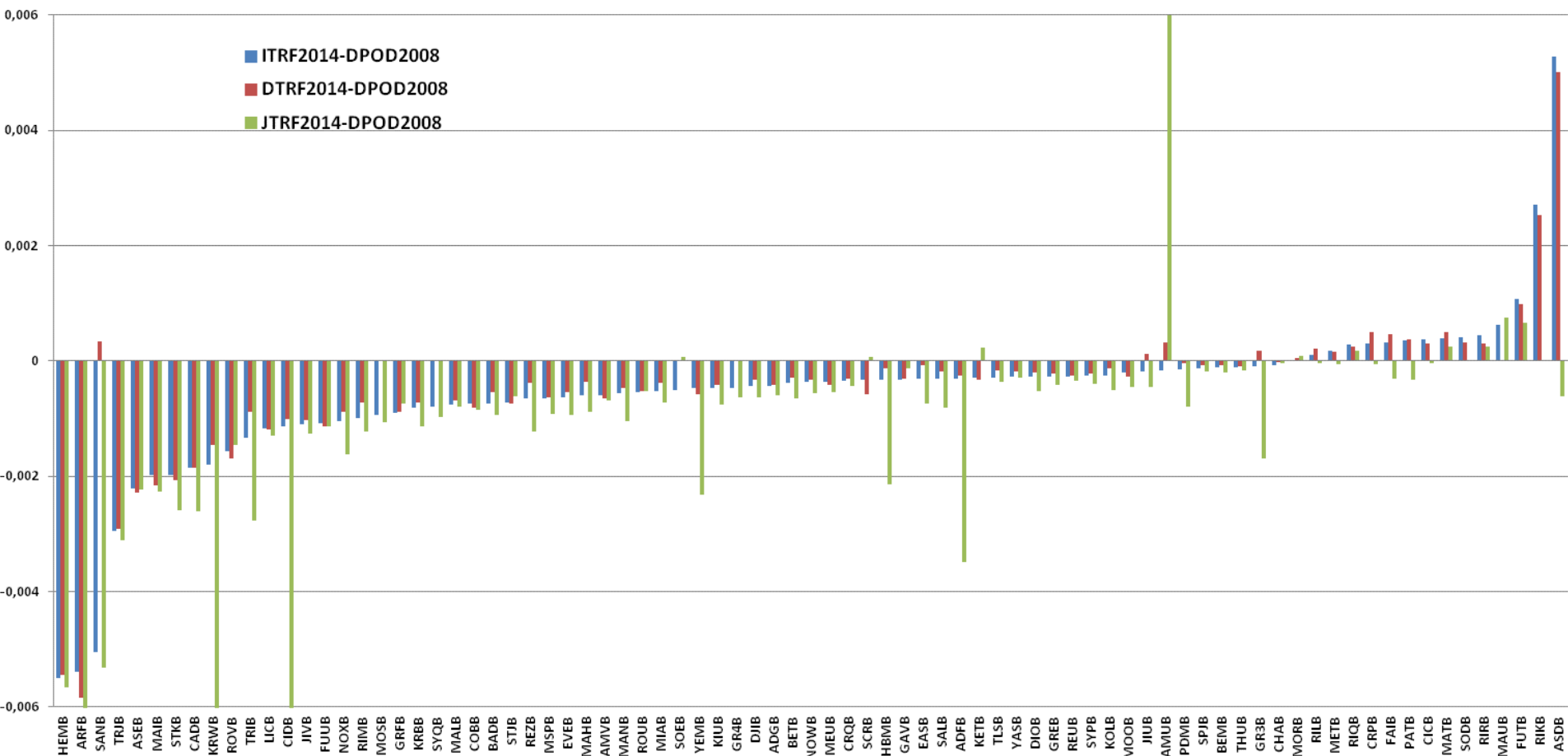
Very small differences

For Jason-2, after 2010 improvement with all new TRF2014s

Less measurements compared to DPOD2008

TRF2014 EVALUATION ON JASON-2 POD

Jason-2 DORIS post-fit residuals differences (TFR2014-DPOD2008)
(DORIS data from Oct. 2008 to Dec. 2014)



Negative => improvement for TRF2014

Very small differences

For Jason-2 improvement for all TRF2014 except for ~10 stations

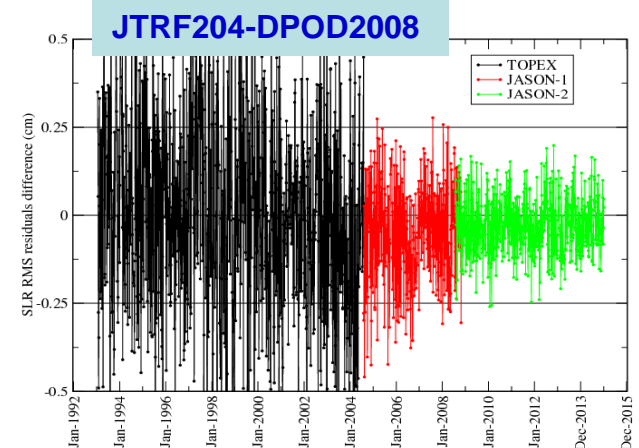
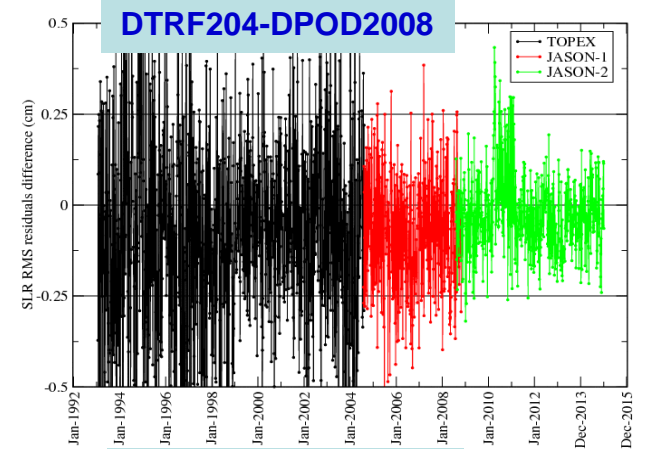
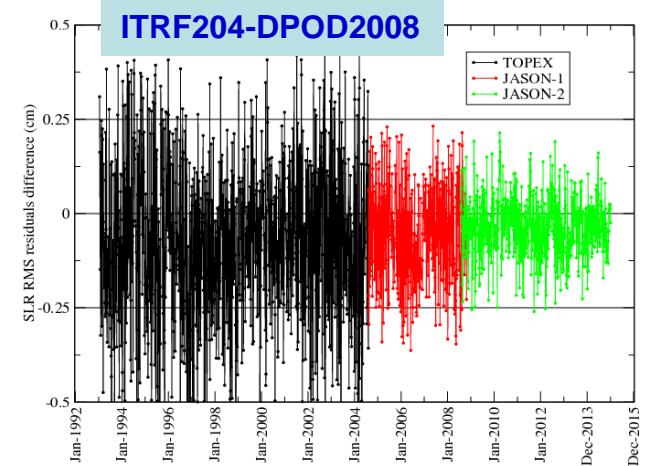
Significant improvement for SAA stations HEMB, ARFB and SANB

TRF2014 EVALUATION

DORIS-only orbit independent SLR RMS residuals and differences with DPOD2008

SATELLITE	TRF Solutions	SLR Points	SLR RMS residuals (cm)
TOPEX 3 Jan. 1993 To 17 Jun. 2004	DPOD2008	1662	4.65
	ITRF2014	1662	4.58
	DTRF2014	1663	4.58
JASON-1 18 Jul. 2004 To 12 Jul. 2008	DPOD2008	1464	2.58
	ITRF2014	1463	2.52
	DTRF2014	1463	2.51
JASON-2 13 Jul. 2008 To 27 Dec. 2014	DPOD2008	1646	2.18
	ITRF2014	1646	2.15
	DTRF2014	1645	2.17
	JTRF2014	1648	2.15

*All new TRFs show an improvement except:
- JTRF2014 for TOPEX
- DTRF2014 for Jason-2 from 2010 to 2011
ITRF2014 shows the best improvement*



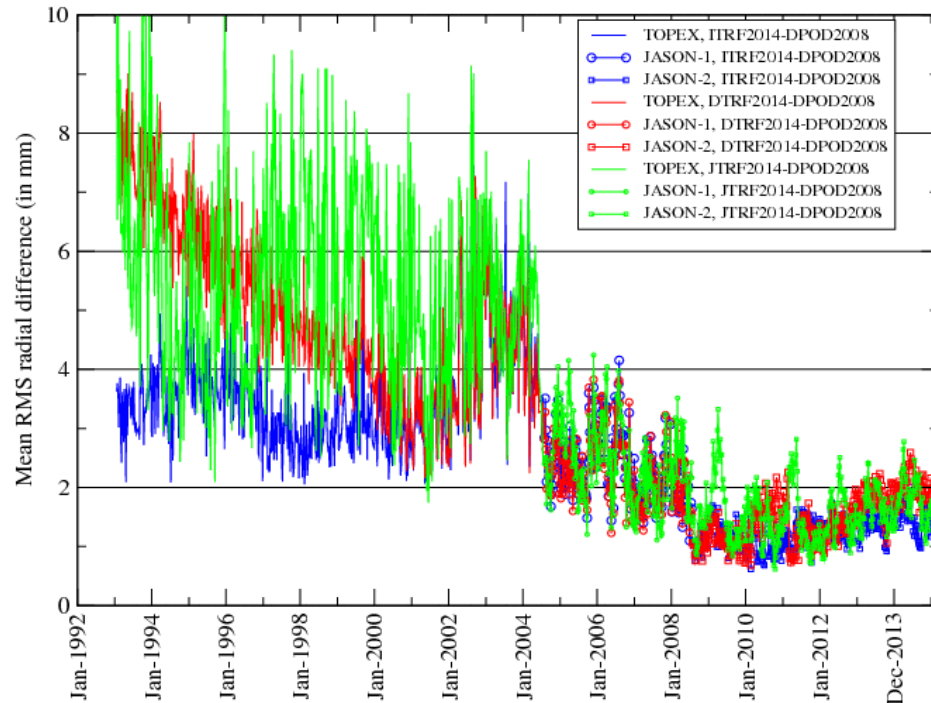
TRF2014 EVALUATION

ORBIT COMPARISON / DPOD2008

RMS of radial differences and mean Z differences

DORIS orbits: TOPEX from Jan. 1993 to Jul. 2004, Jason-1 from Jul. 2004 to Oct. 2008, Jason-2 from Oct. 2008 to Dec. 2014

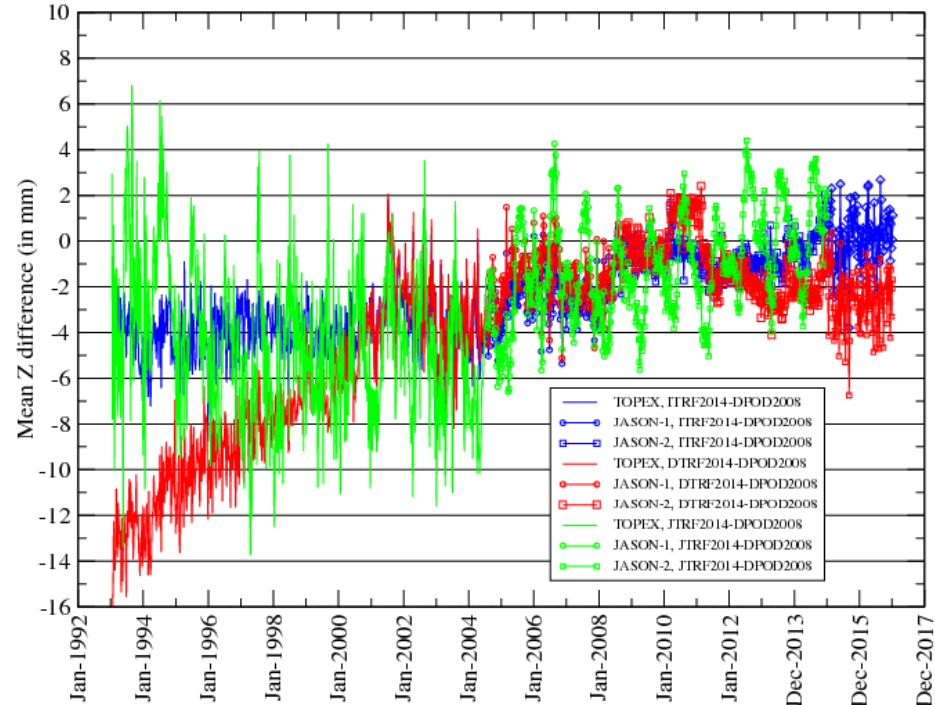
Mean RMS of radial differences per arc



Mean RMS radial differences:

- dispersion and level of RMS higher (and different) between 1993 and 2004 for 3 TRF2014
- important drift from 1993 to 2001 for DTRF2014
- a few mm I-D-JTRF2014 after 2004
- annual signal in JTRF2014
- correlated to the scale differences

Mean of Z orbit differences per arc



Orbit centering difference in the Z direction:

- important drift from 1993 to 2001 for DTRF2014
- drift consistent between the 3 TRFs after 2002
- annual signal for JTRF2014 (weekly solution)
- different geocenter than those of DPOD2008
- correlated to the T_z parameter differences

CONCLUSIONS

DORIS post-fit residuals differences global and per station / DPOD2008

- Differences are at a very low level in particular for the Jason-1 and Jason-2 results
- For the ITRF2014 and DTRF2014 solutions, the most significant improvements are obtained for years from 1992 to 1998 and from 2010 to 2014, probably due to the improvement of the estimation of the station velocities compared to those estimated in the DPOD2008 solution realization
- The ITRF2014 realization is used for the DPOD2014 solution which will be used for the operational processing of DORIS data.

Orbit Comparison wrt DPOD2008 orbit

- The orbits are very close in particular before 2004
- There is an important drift from 1993 to 2001 for DTRF2014
- There is an annual signal for JTRF2014 (weekly solution)
- The geocenter is different than those of DPOD2008
- The Z-offset is correlated to Tz Helmert parameter differences