DORIS evaluation of the DGFI, JPL and IGN TRF2014 solutions

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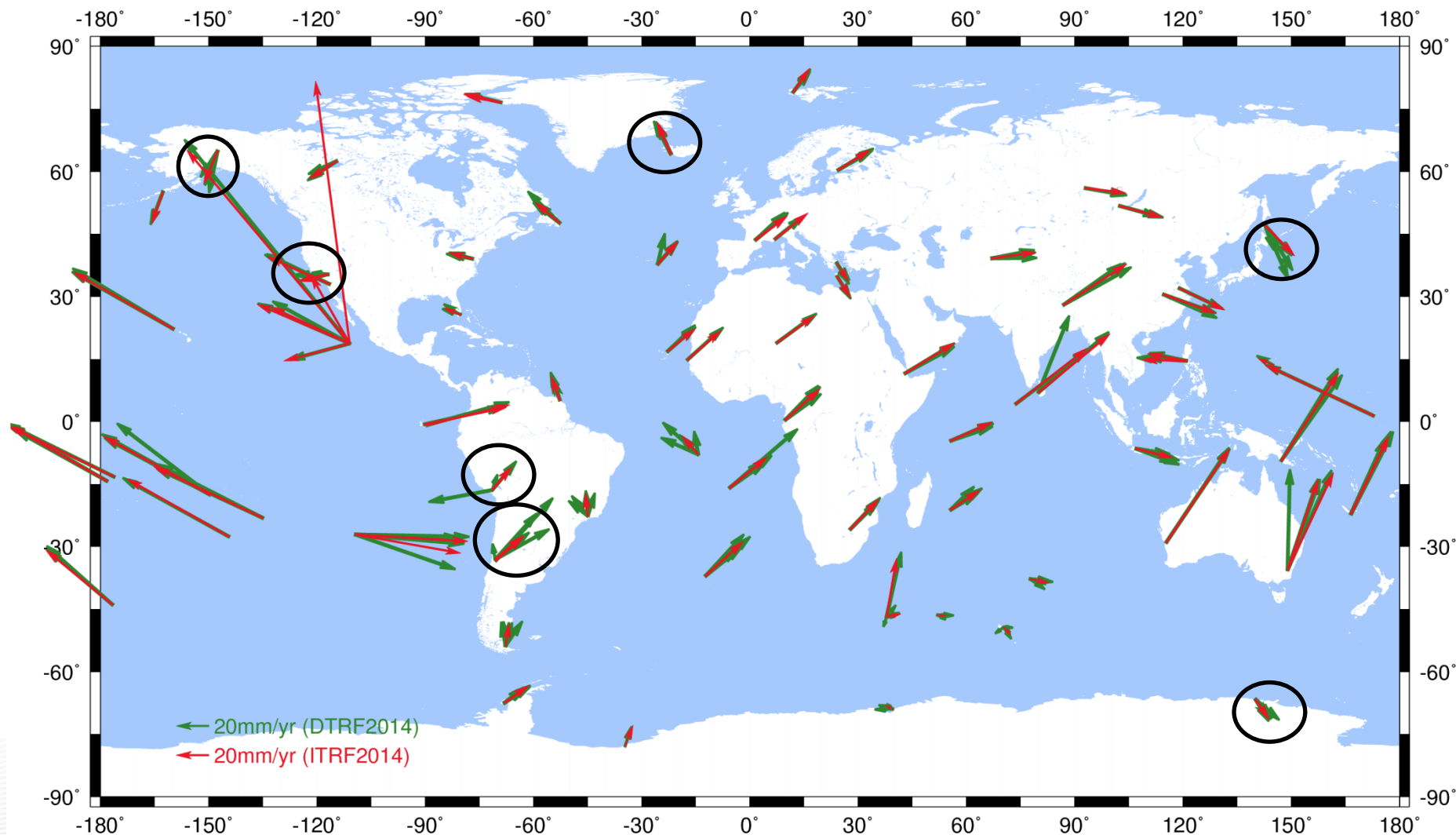# DTRF2014, ITRF2014 and JTRF2014

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• **Input: IDS 09 combined series (1993.0-2015.0).**

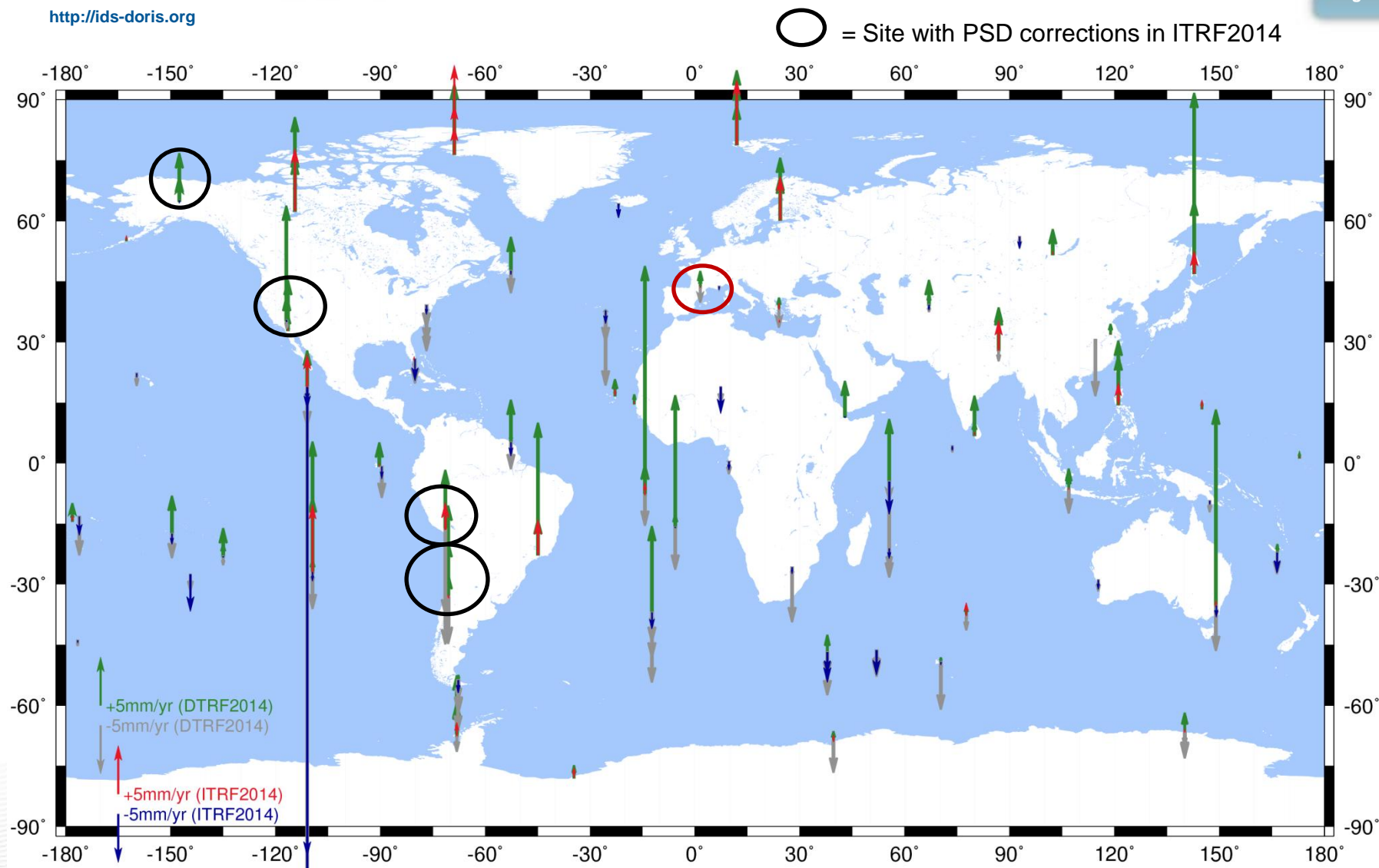| Solution	DTRF2014	ITRF2014	JTRF2014
Producer	DGFI	IGN	JPL
Nb of files	1	1	1838
Nb of DORIS sites	71	71	71
Nb of DORIS stations	153	160	159
Nb of discontinuities	46	62	24*
Technique	Least-squres	Least-squares	Kalman
Post-seismic deformation	No	Yes (7sites; 13 stations)	No
Velocity constraints over successive epochs	No	Yes	Yes

• **DGFI stations = IGN stations – {BELB, GR4B, MAUB, MOSB, NOUB, SOEB, SYQB}, i.e. stations with less than 300 days of observations.**
• **JPL stations = IGN stations – BELB**

• **IGN – DORIS sites with PSD corrections: Arequipa, Fairbanks, Goldstone, Reykjavik, Santiago, Terre-Adélie, Yuzhno-Sakhalinsk.**

• **Nb of epochs: 151 in common between DGFI and IGN.**
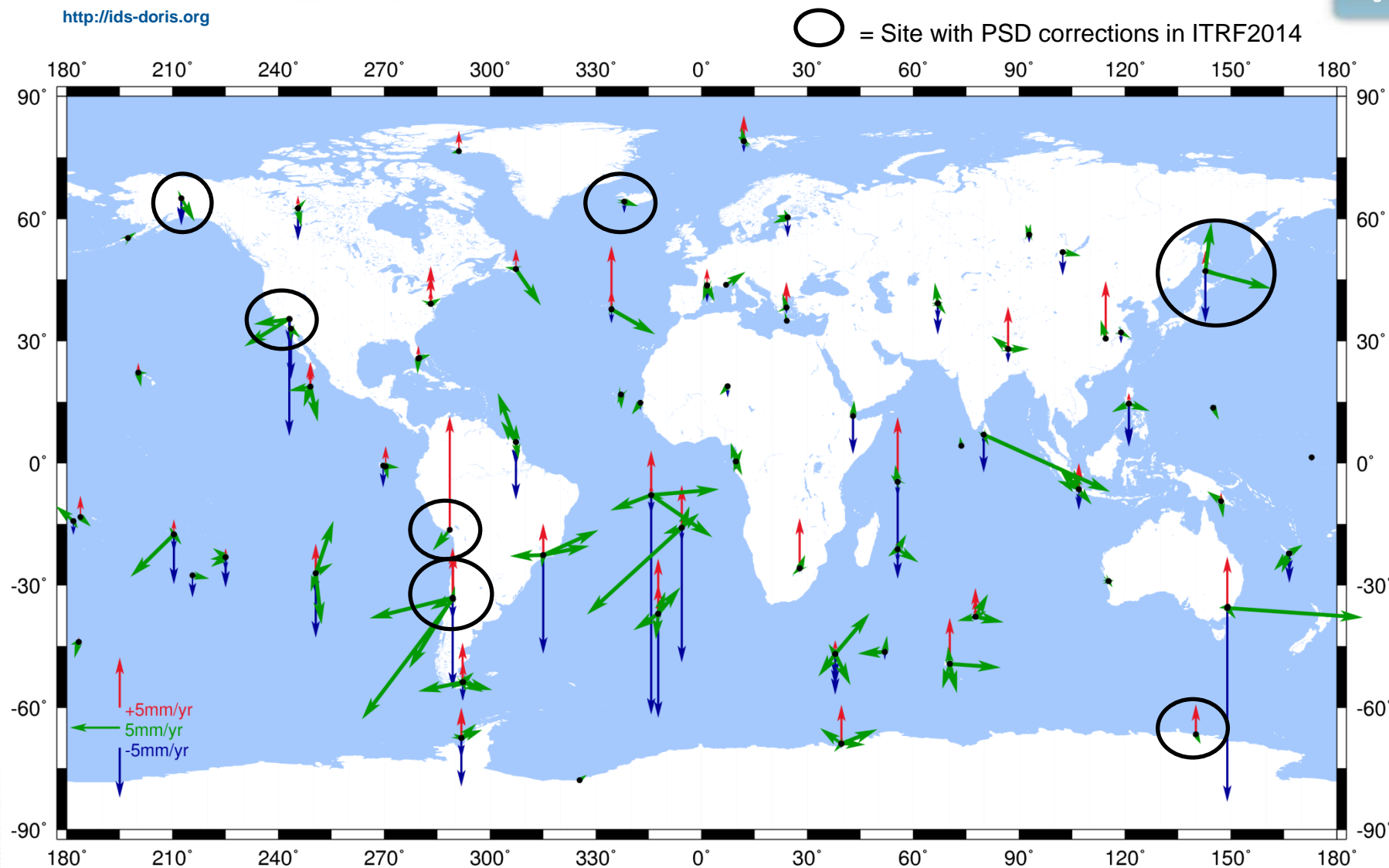
DTRF2014 & ITRF2014 Horizontal Velocities

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◯ = Site with PSD corrections in ITRF2014

← 20mm/yr (DTRF2014)
← 20mm/yr (ITRF2014)

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DTRF2014 & ITRF2014 Vertical Velocities

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= Site with PSD corrections in ITRF2014

+5mm/yr (DTRF2014)
-5mm/yr (DTRF2014)

+5mm/yr (ITRF2014)
-5mm/yr (ITRF2014)

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DTRF2014 & ITRF2014 Velocity differences

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○ = Site with PSD corrections in ITRF2014

+5mm/yr
5mm/yr
-5mm/yr

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DORIS network for the Helmert parameters
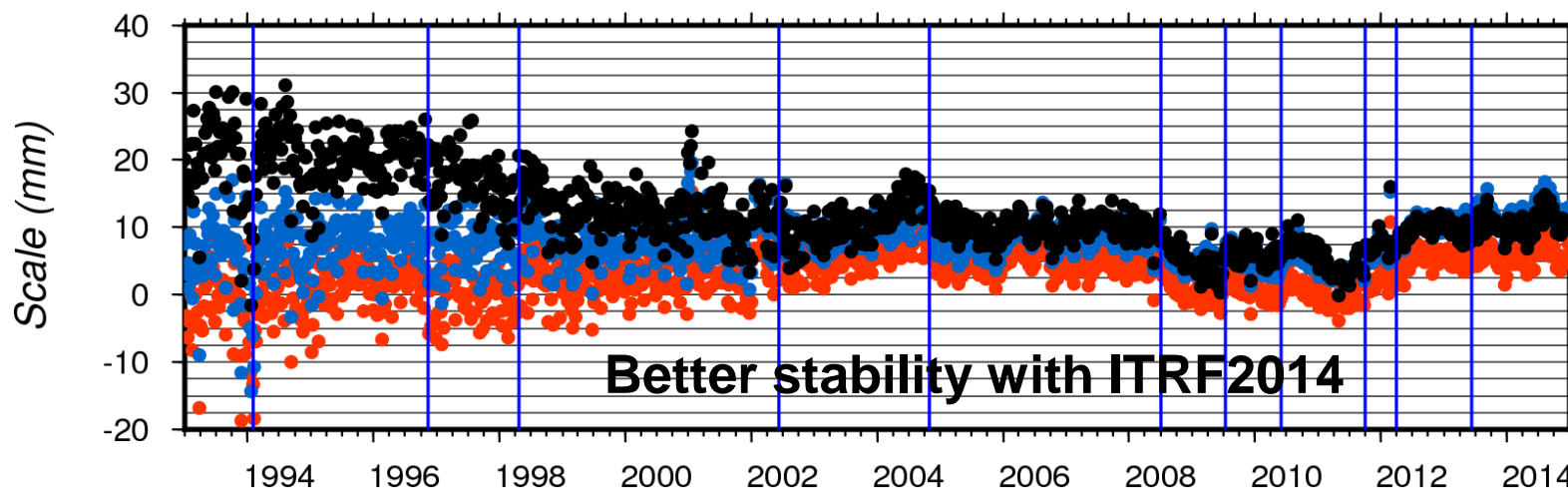
DTRF2014 / ITRF2014 / JTRF2014
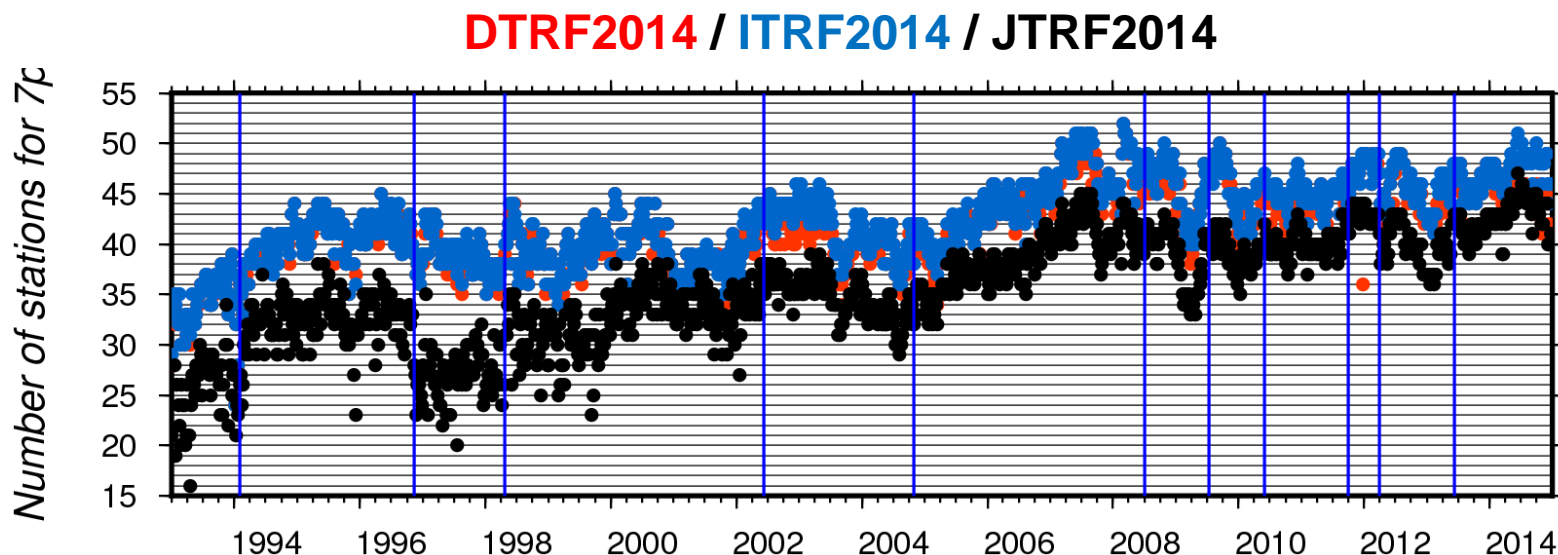
- **Less stations with JTRF2014 due to a more aggressive data editing.**
- **Few stations less with DTRF2014 compared to ITRF2014 must be the consequence of no continuity velocity constrains (➔ less accurate positions and velocities)**
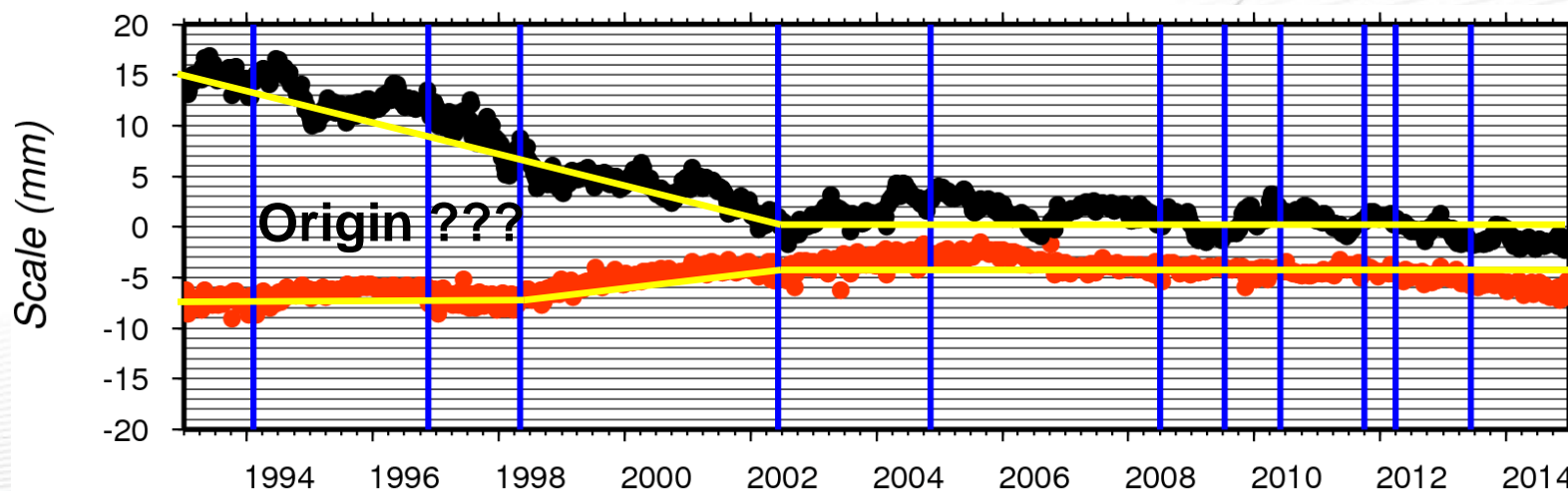
To avoid any impact of the DORIS network, in the following, we use the same weekly network for the estimation of the Helmert parameters.

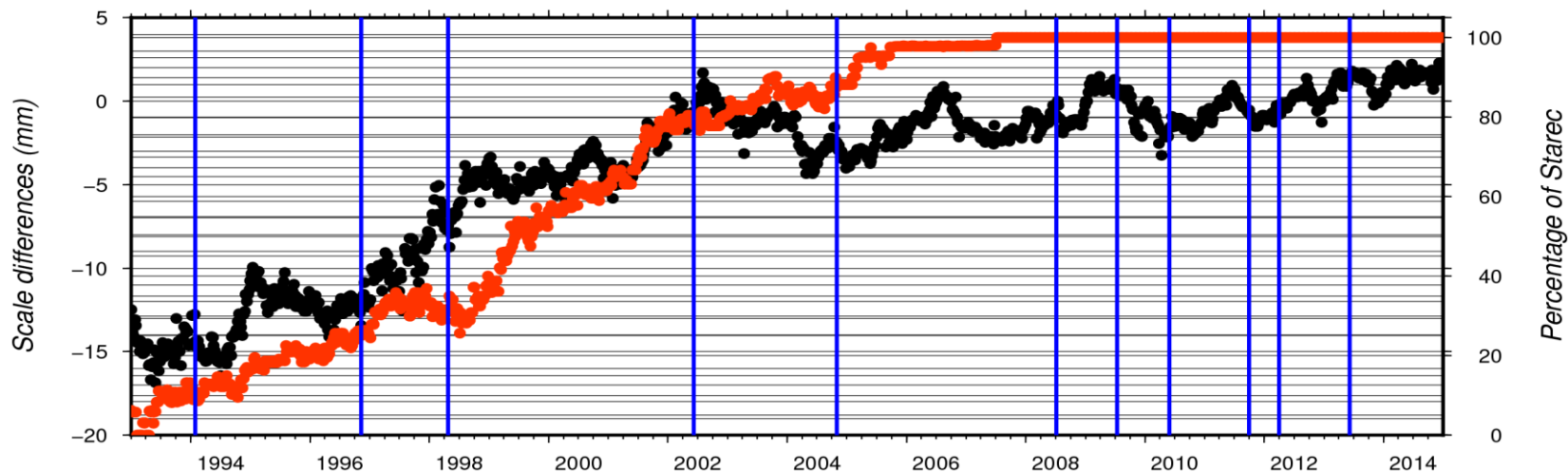# IDS 09 scales wrt XTRF2014 (X=D, I, J)

DTRF2014 / ITRF2014 / JTRF2014

Better stability with ITRF2014

DTRF2014 - ITRF2014 / JTRF2014 – ITRF2014
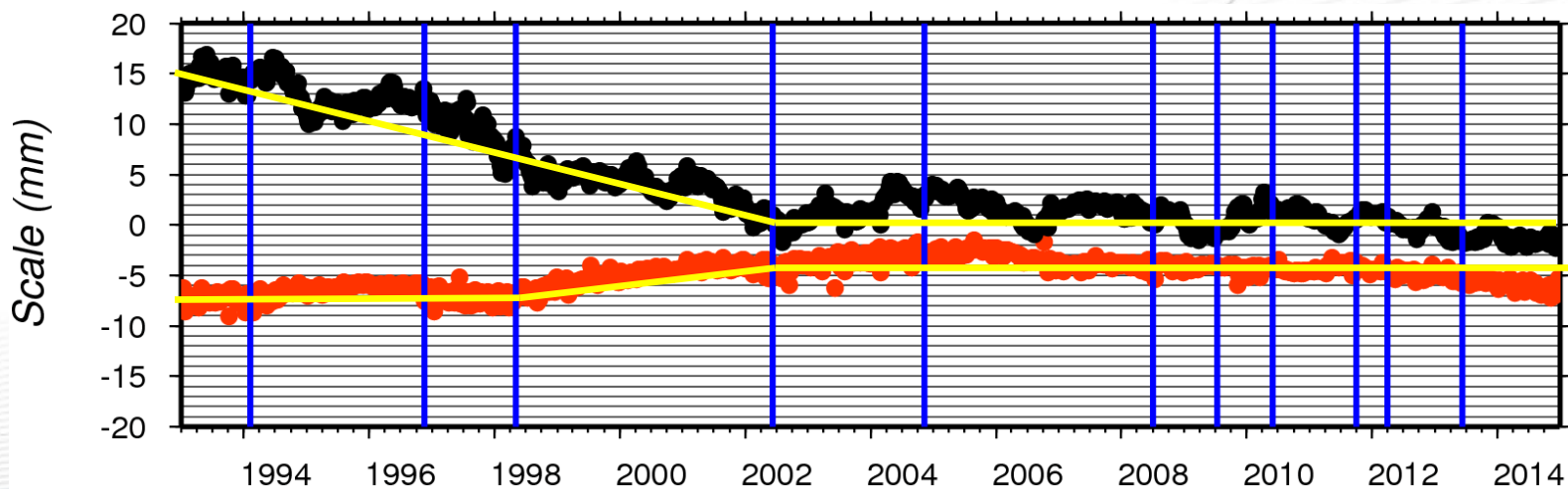

Origin ???

Scale differences

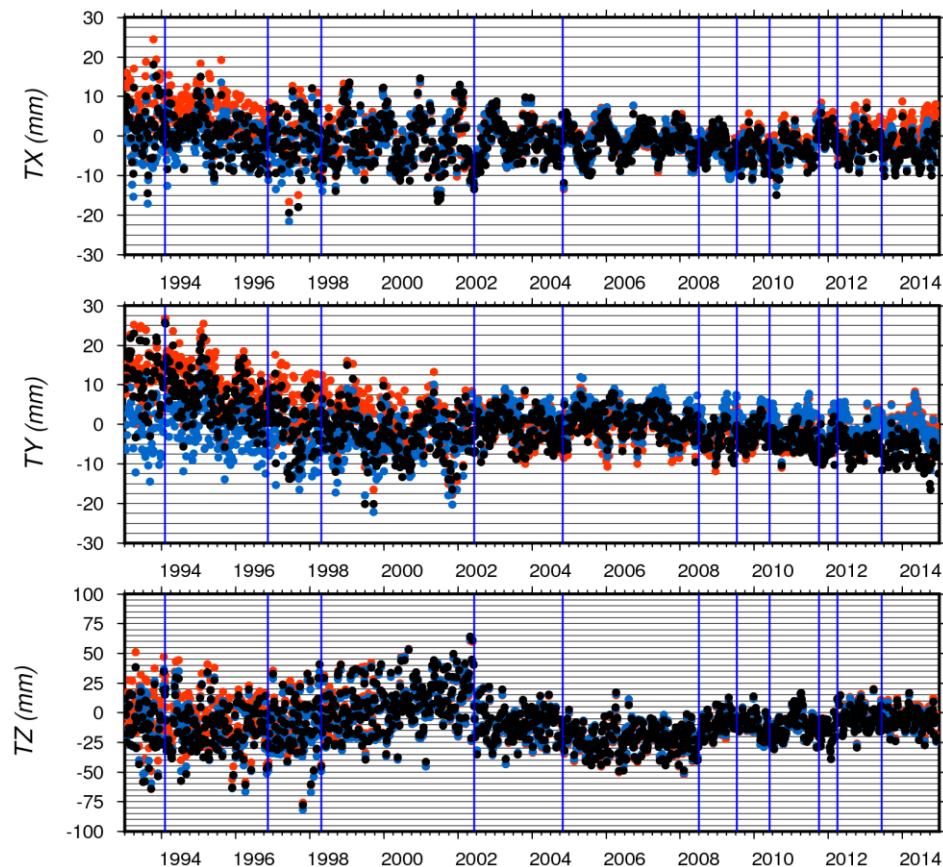## ITRF2014 - JTRF2014 / % of Starec

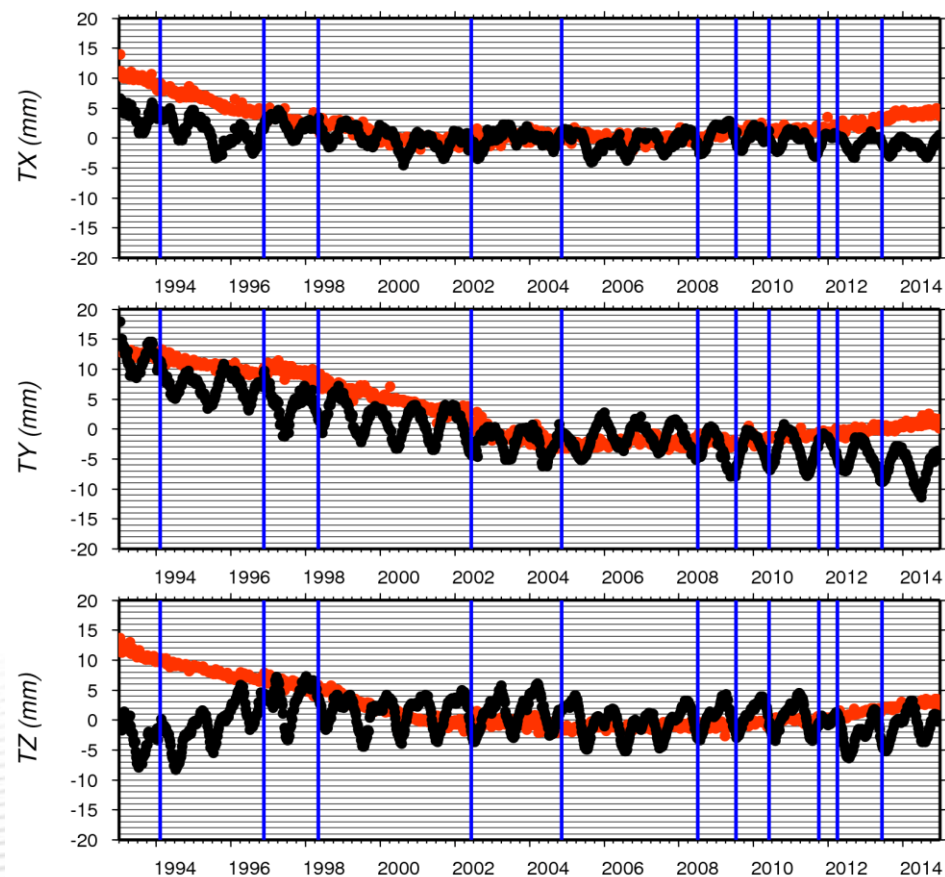## DTRF2014 - ITRF2014 / JTRF2014 – ITRF2014

IDS 09 Translations wrt XTRF2014 (X=D, I, J)

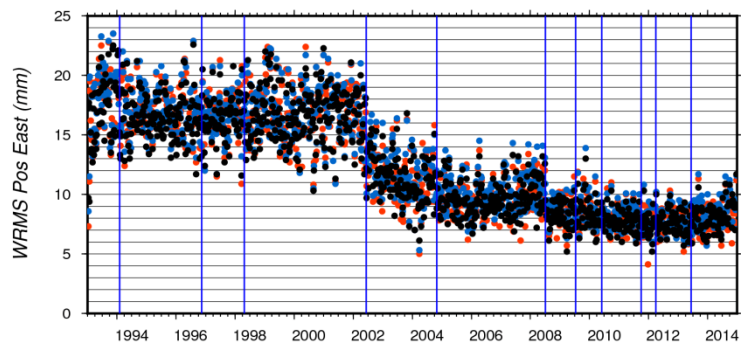**DTRF2014 / ITRF2014 / JTRF2014**

DTRF2014 - ITRF2014 / JTRF2014 – ITRF2014

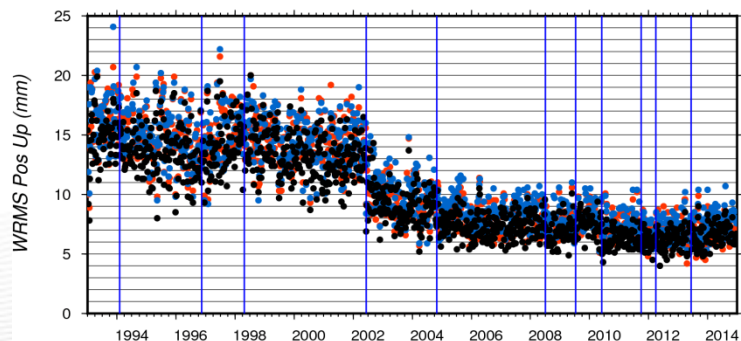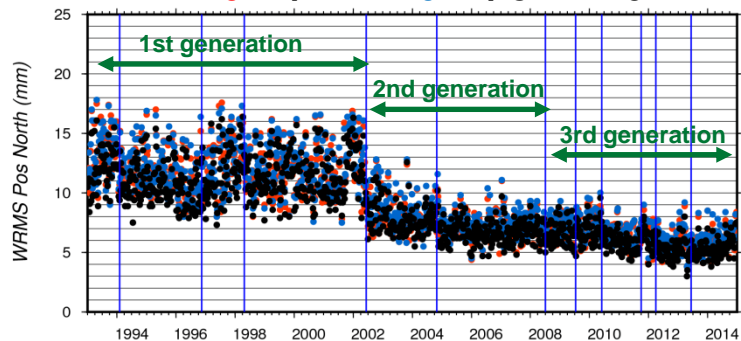• **In overall, similar performances.**

• **JTRF-ITRF translations show annual variations due to the to the including in the JPL processing of the station displacements induced by temporal changes of planetary fluid masses.**

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DTRF2014 / **ITRF2014** / **JTRF2014**

- In overall, similar performances at the millimetric level.
- Slightly better performances of JTRF2014 due the Kalman filtering process.

Unit = mm		DTRF2014	ITRF2014	JTRF2014
1993.0-2002.4	North	12.1 ± 2.0	12.3 ± 2.1	11.3 ± 1.9
	East	17.0 ± 2.2	17.1 ± 2.2	16.6 ± 2.2
	Up	14.8 ± 2.2	15.0 ± 2.2	13.6 ± 2.0
2002.4-2008.5	North	7.5 ± 1.3	7.9 ± 1.3	7.2 ± 1.2
	East	10.3 ± 1.9	10.7 ± 1.9	10.3 ± 1.8
	Up	8.6 ± 1.6	9.1 ± 1.6	8.1 ± 1.5
2008.5-2015.0	North	6.4 ± 1.1	6.6 ± 1.1	5.9 ± 1.1
	East	8.0 ± 1.2	8.4 ± 1.2	8.0 ± 1.1
	Up	7.3 ± 1.1	7.6 ± 1.2	6.6 ± 1.0

Comparison to DORIS-DORIS IGN tie vectors

DTRF2014 / **ITRF2014** / **JTRF2014**
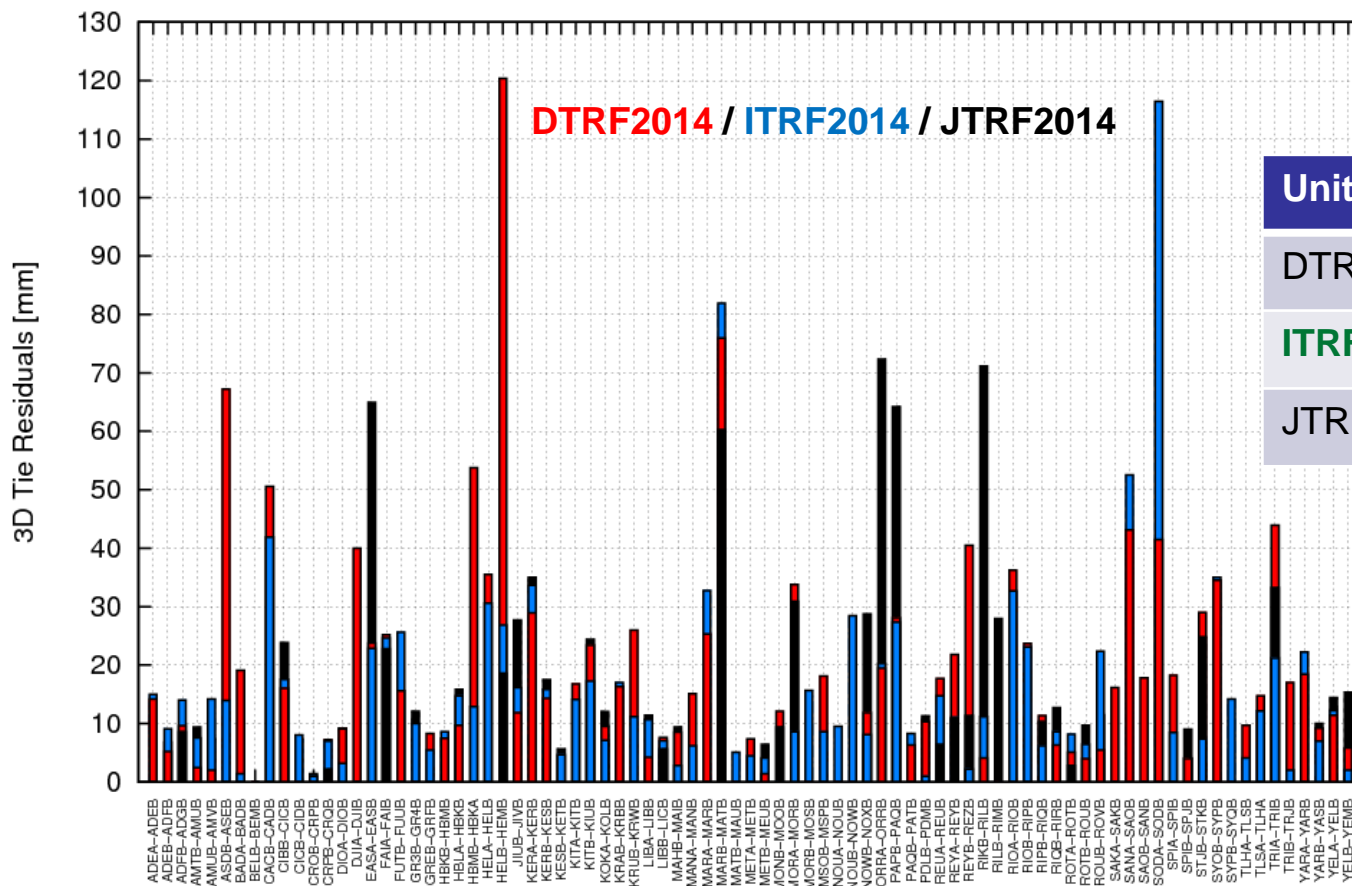
Statistics over 50 common ties

Unit = mm	Mean	STD	RMS
DTRF2014	17	20	26
ITRF2014	**13**	**13**	**18**
JTRF2014	18	19	26

- **Differences between coordinate differences from XTRF2014 and IGN ground tie vectors.**

- **JTRF2014: ties obtained as coordinate differences if end and start separated by less than one year.**

Conclusions

- **3 independent TRF2014 realizations with 2 different techniques.**

- **DTRF2014**
    - **Some stations are missing.**
    - **No continuity velocity constraint ➔ <u>few unrealistic velocities</u>.**
    - **Positioning performances similar to ITRF2014.**
    - **Adding of non tidal corrections has no significant impact.**

- **ITRF2014**
    - **Contains the highest number of DORIS sites.**
    - **Include PSD corrections.**
    - **Stability of the Helmert parameters.**
    - **Gives the smallest differences with the ground ties.**

- **JTRF2014**
    - **Is a set of weekly solutions. No velocity ➔ <u>can not be used after 2015.0</u>.**
    - **Contains less stations due to a more aggressive data editing.**
    - **Slightly better performances in station position residuals.**
    - **Scale pattern before 2002 is not explained.**