DPOD2020 version 3.0

Guilhem Moreaux (IDS Combination Center) – 2024/07/24

DPOD2020 v3.0

- **Based on the DORIS position and velocity cumulative solution ids24d01 (stacking of the IDS combined series ids 19/23 from 1993 doy 003 to 2023 doy 365).**

- **As version 2.0, this new release includes:**
  - **Annual and semi-annual corrections.**
  - **Post-Seismic Deformation corrections from DORIS observations only.**

- **Note that in version 3.0, periodic terms were only estimated for sites with observations after mid-2002 while the second generation of the DORIS receiver was introduced.**

- **Available in SINEX and text formats.**

- **SINEX solution contains two additional (and unofficial) blocks:**
  - **SOLUTION/DISCONTINUITY: origin (ex: earthquake, beacon change, antenna problem…) of the position discontinuities.**
  - **SOLUTION/DATA_REJECT: periods of time not included in the combination.**

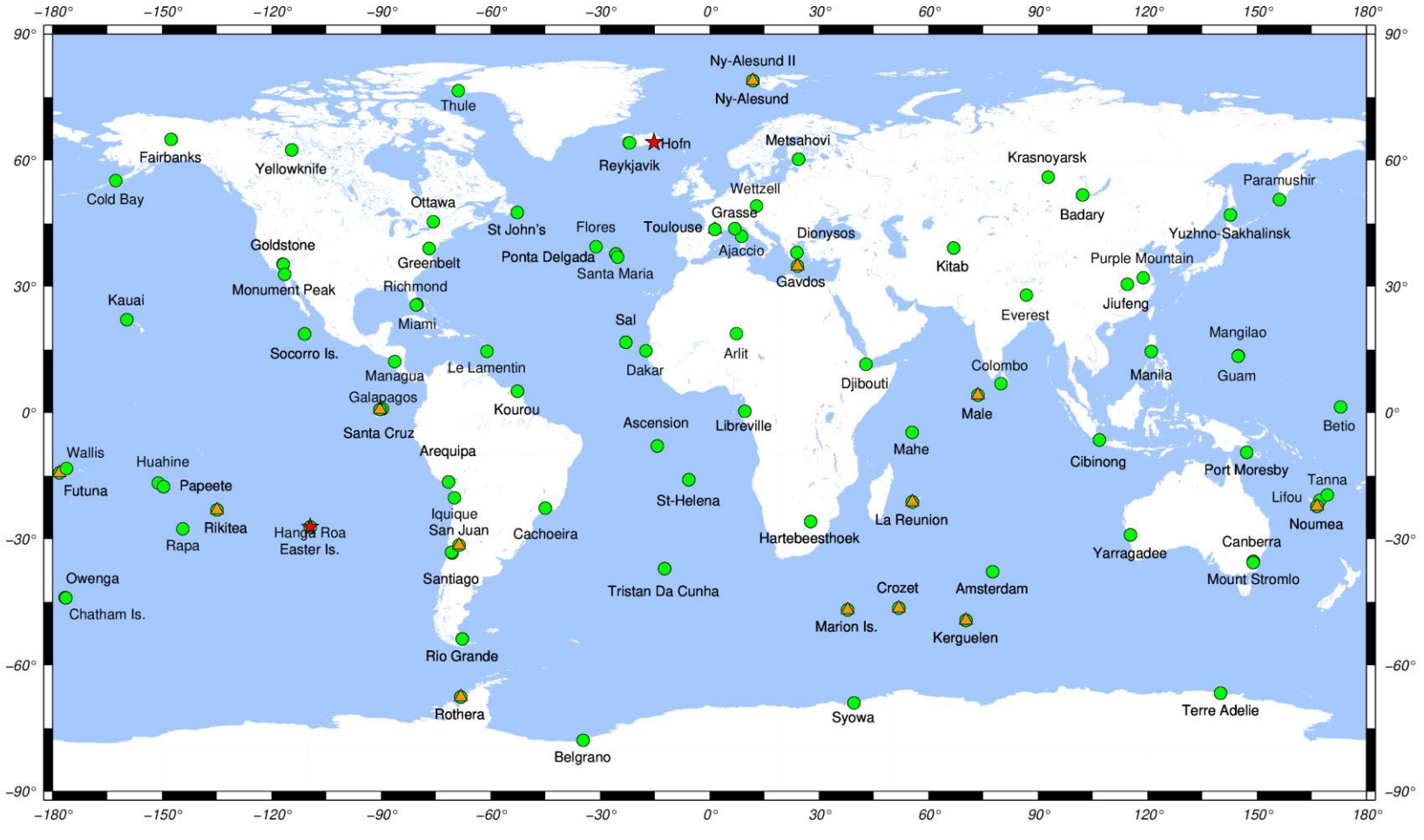
- **To facilitate the identification of stations which were active early 2024, for these stations, their ending time in the SOLUTION/EPOCHS were set to 49:365:86399.**

DPOD2020 v3.0 – Velocity Constraints

Site	DORIS station	Reference station	Technique	Source
Ajaccio	AJAB	AJAC	GNSS	ITRF2020
Huahine	HUAA	7123	Laser Ranging	ITRF2020
Gavdos	GAVC	DORIS mail 1367		
Hanga Roa	HROC	EISL	GNSS	ITRF2020
San Juan	SJUC	OAFA	GNSS	ITRF2020
San Juan	SJVC	OAFA	GNSS	ITRF2020

DPOD2020 v3.0 - Network

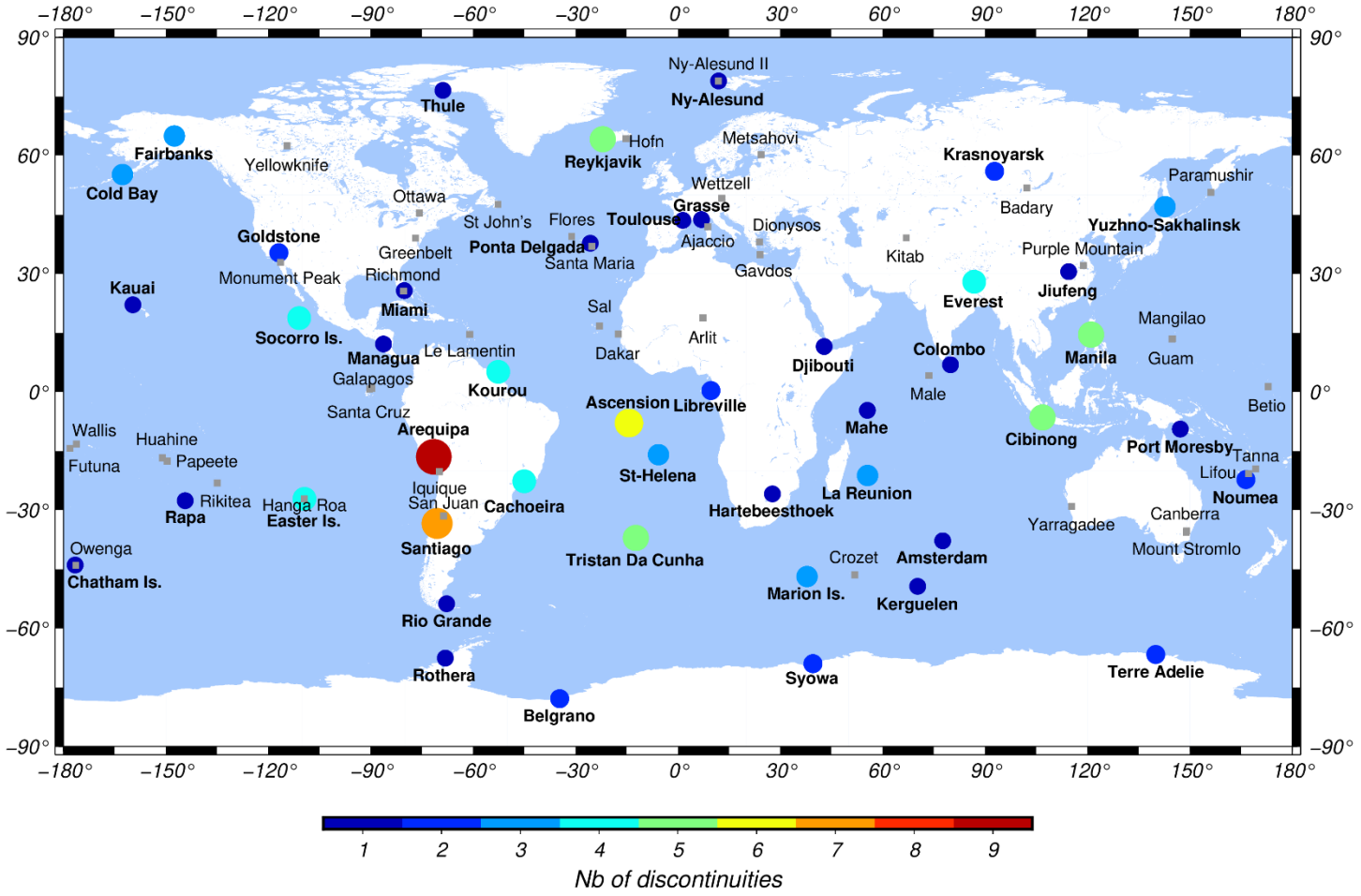
89 DORIS sites – 221 DORIS stations
Compared to ITRF2020: 2 sites and 20 stations more.



Site not included ITRF2020 (# 2) – Site with new station(s) since ITRF2020 (# 14)

DPOD2020 v3.0 – Position Discontinuities

Number of discontinuities by DORIS site. Sites with discontinuities are in boldface. Sites with no discontinuity are indicated with grey squares.



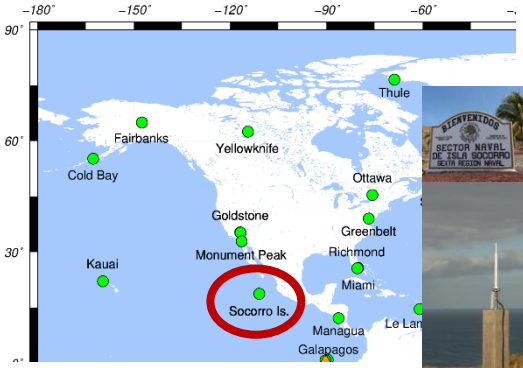
DPOD2020 v3.0 – Position Discontinuities

	DPOD2020 v3.0	DPOD2020 v2.0
Overall number	114	112
Nb of affected sites	45	44
Nb of affected stations	61	60
With geophysical origin	59	55
With technical origin	21	21
With unknown origin	34	36

DPOD2020 v3.0 vs v2.0 – Position Discontinuities

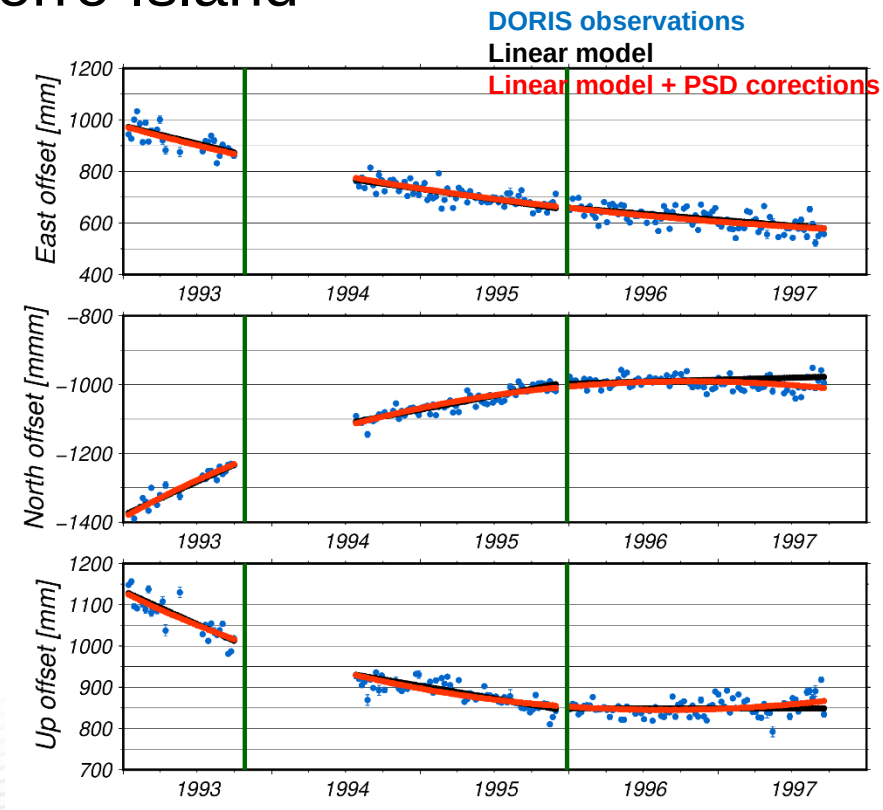
- **ARFB:**
  - **No more discontinuity of unknown origin on 2020/09/09 and 2021/01/01.**
  - **New discontinuity on 2020/05/31 due to the M6.1 Earthquake (@148km).**
  - **New discontinuity on 2022/05/26 due to the M7.2 Earthquake (@216km).**
- **ASEB:**
  - **New discontinuity on 2022/06/11 due to the M5.6 Earthquake (@80km).**
- **BEMB:**
  - **No more discontinuity of unknown origin on 2017/01/01.**
  - **New discontinuity on 2018/11/14 due to the landlside associated to the permafrost warming.**
  - **New discontinuity of unknown origin on 2020/09/13.**
- **EASB:**
  - **No more discontinuity on 2009/09/17 due to the M6.2 Earthquake (@360km).**
- **KOLB:**
  - **New discontinuity on 2023/04/17 with the balise change due to a problem with the former USO.**
- **MANB:**
  - **No more discontinuity at the end of the data gap on 2004/07/10.**
  - **New discontinuity on 2004/10/08 due to the M6.5 Earthquake (@87km).**

SODA – Socorro Island



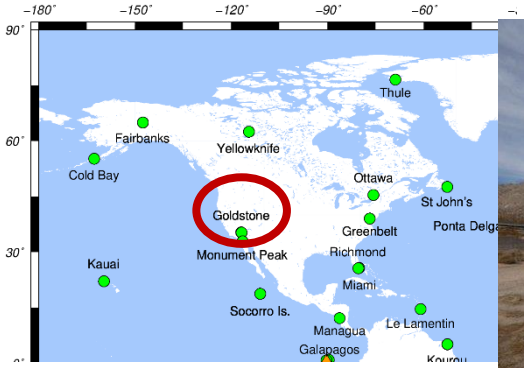
DORIS is at Socorro since 1991/02/08.
Host agency: INEGI & Armada de Mexico.
Tide gauge (Gloss nb 162) @ 370m.
No GNSS, no SLR, no VLBI.

Submarine eruption on 1993/01/29 @ 4km.



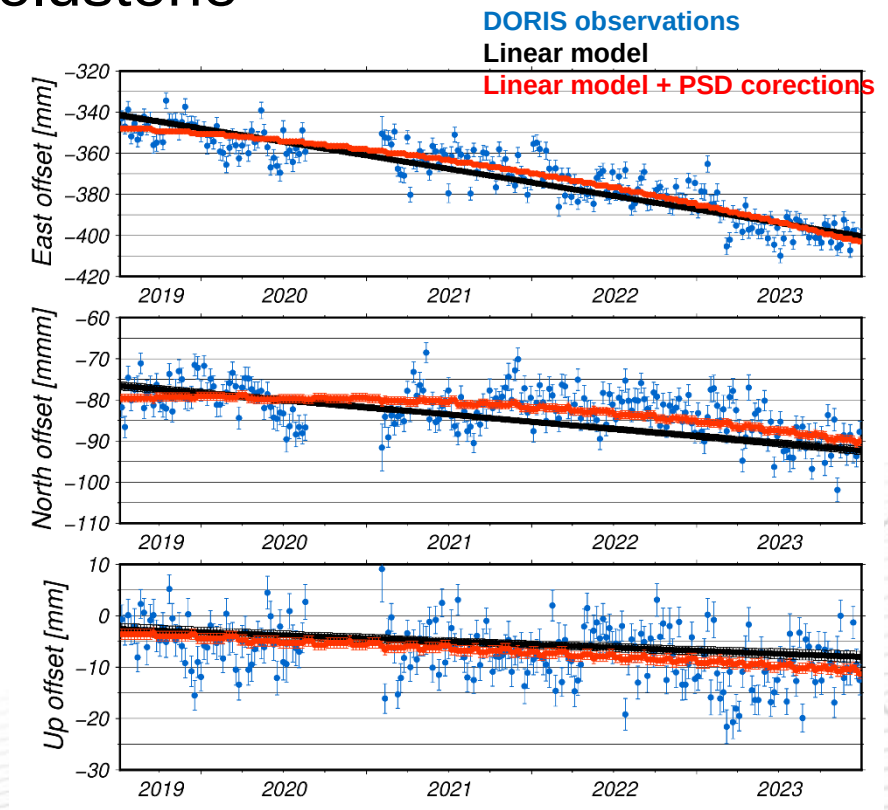
PSD weekly corrections from 1993/01/13 to 1997/09/17.
PSD corrections are given in ASCII text file dpod2020_030_psd_corr.txt.

GONC – Goldstone



DORIS is at Socorro since 1988/01/21.
Host agency: NASA.
No colocation.

M7.1 Earthquake on 2019/07/06 @ 93km.

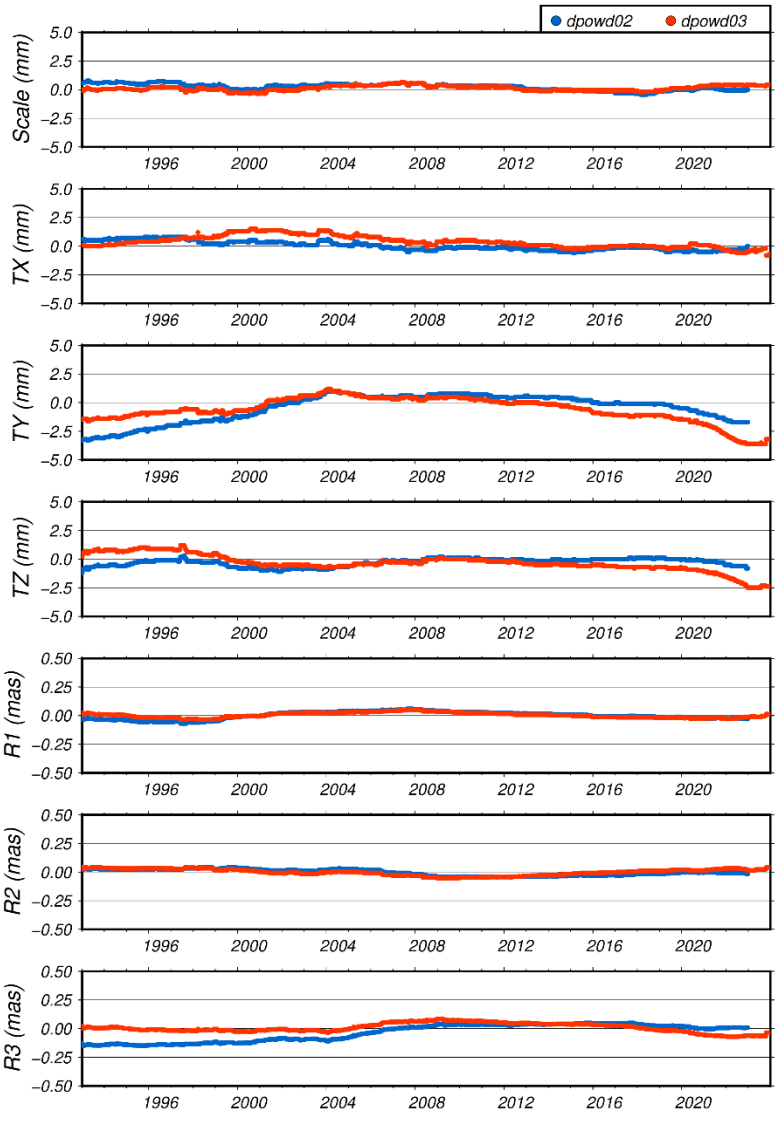


New PSD correction.

PSD weekly corrections from 2019/07/10 to 2025/12/31.

PSD corrections are given in ASCII text file dpod2020_030_psd_corr.txt.

DPOD2020 v3.0 vs ITRF2020

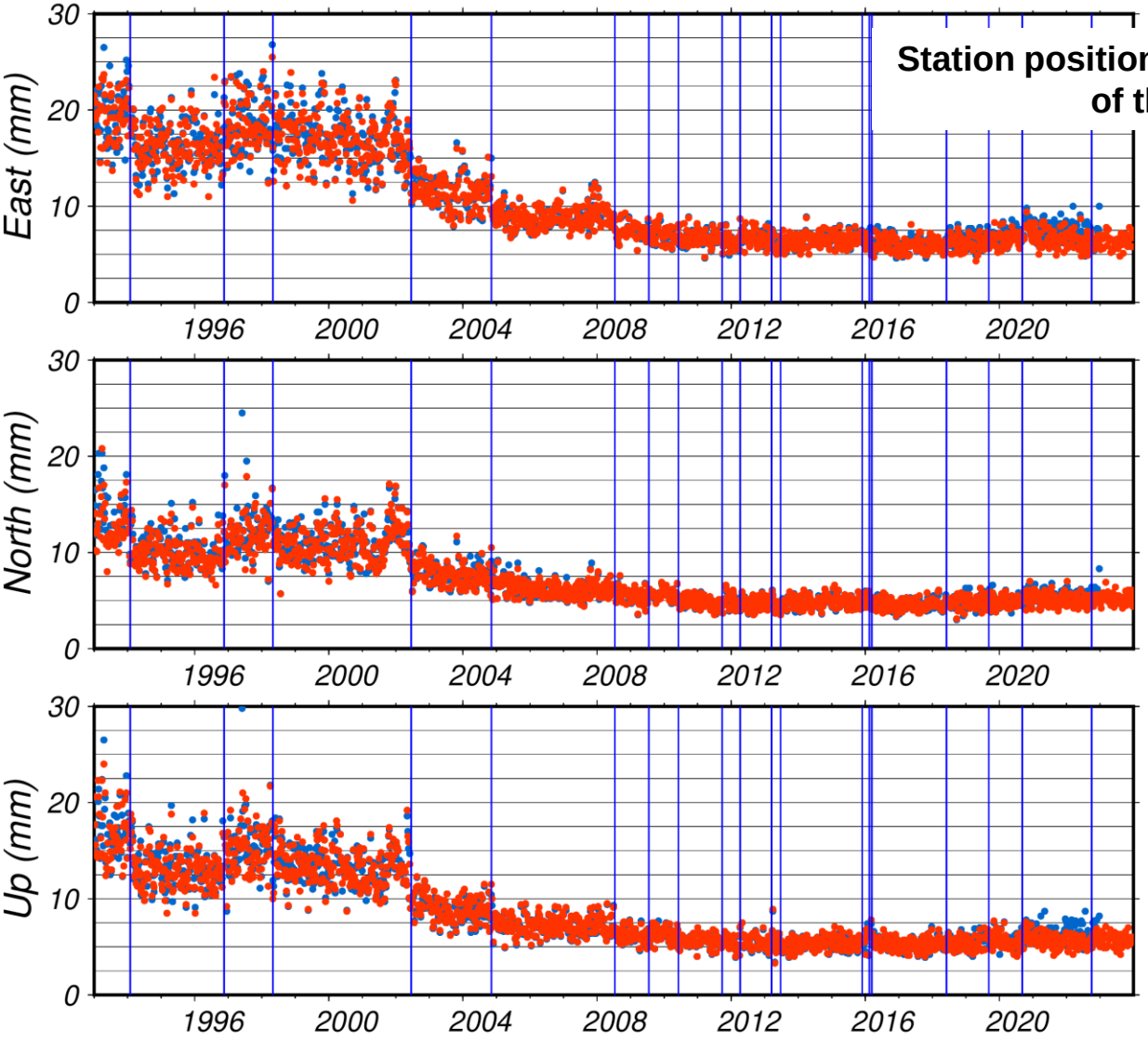


Helmert parameters of the weekly propagations of DPOD2020 version 3.0 and version 2.0 wrt ITRF2020 without annual and semi-annual corrections.

	DPOD2020 v3.0			DPOD2020 v2.0		
	mean	std	rms	mean	std	rms
Sc [mm]	**0.12**	**0.22**	**0.26**	**0.24**	**0.29**	**0.37**
Tx [mm]	**0.38**	**0.52**	**0.64**	**0.03**	**0.39**	**0.39**
Ty [mm]	**-0.61**	**1.08**	**1.24**	**-0.46**	**1.19**	**1.27**
Tz [mm]	**-0.34**	**0.74**	**0.82**	**-0.29**	**0.33**	**0.44**
R1 [mas]	**0.00**	**0.02**	**0.02**	**0.00**	**0.03**	**0.03**
R2 [mas]	**0.00**	**0.03**	**0.03**	**0.00**	**0.03**	**0.03**
R3 [mas]	**0.01**	**0.04**	**0.04**	**-0.04**	**0.07**	**0.08**

Similar results for DPOD2020 v2.0 and v3.0. Lower Ty offset between 1993.0 and 2004.0 with DPOD2020 v3.0.

DPOD2020 v3.0 vs ITRF2020

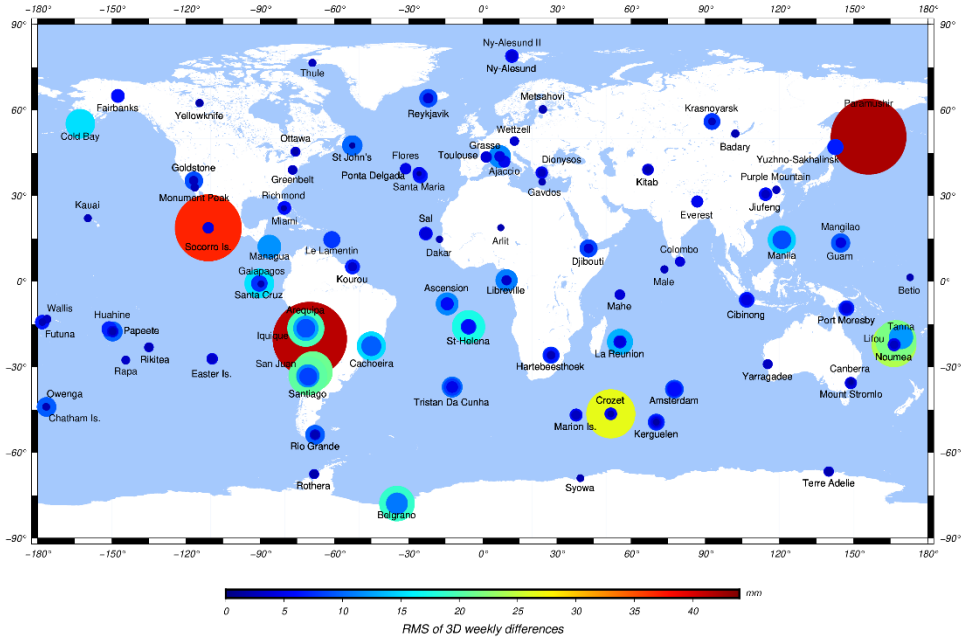


Station position residuals as output of the stacking of the IDS combined series.

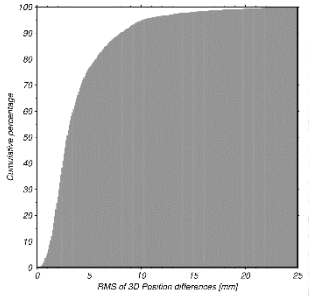
Slightly smaller residuals with DPOD2020 v3.0 than DPOD2020 v2.0 from 2021.0 in East and Up.

DPOD2020 v3.0 vs ITRF2020

Weekly station coordinate differences between DPOD2020 v3.0 and ITRF2020 from 1993.0 to 2024.0.
Without annual and semi-annual corrections.



	[mm]
Max	127.5
Median	3.1
RMS	6.8
Mean	4.7
STD	5.0

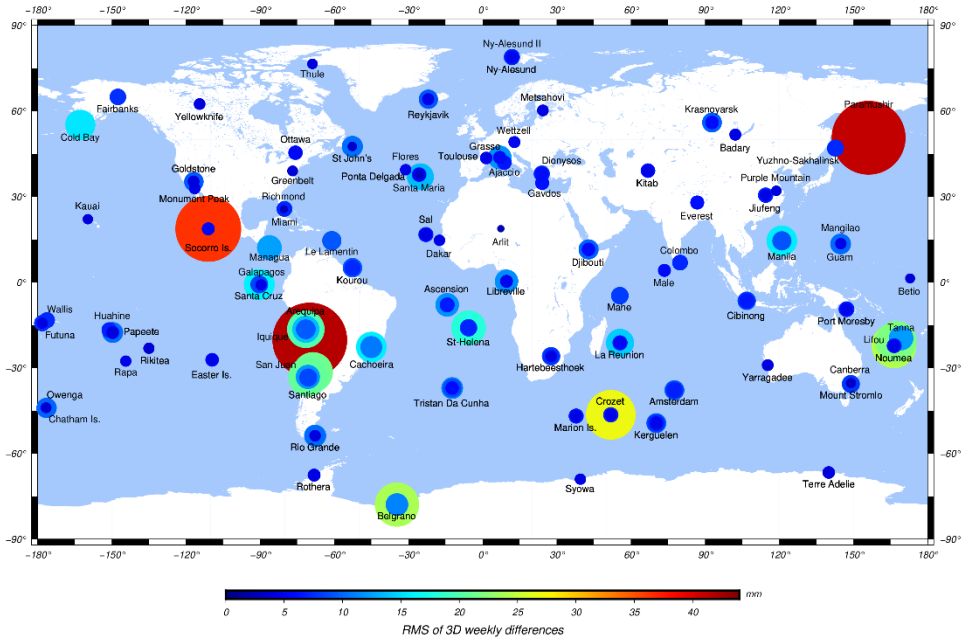


77% of the weekly 3D differences are smaller than 5 mm.
Largest differences

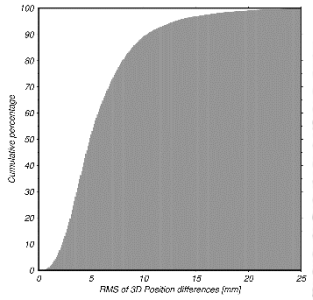
- ✓ **Paramushir, Iquique (very short time span).**
- ✓ **Socorro Island (one velocity vector for all the time segments in ITRF2020).**
- ✓ **Crozet (CRQC – smaller DORIS tie residuals for DPOD2020).**

DPOD2020 v3.0 vs ITRF2020

Weekly station coordinate differences between DPOD2020 v3.0 and ITRF2020 from 1993.0 to 2024.0.
With annual and semi-annual corrections.



	[mm]
Max	124.6
Median	5.0
RMS	7.9
Mean	6.2
STD	4.9

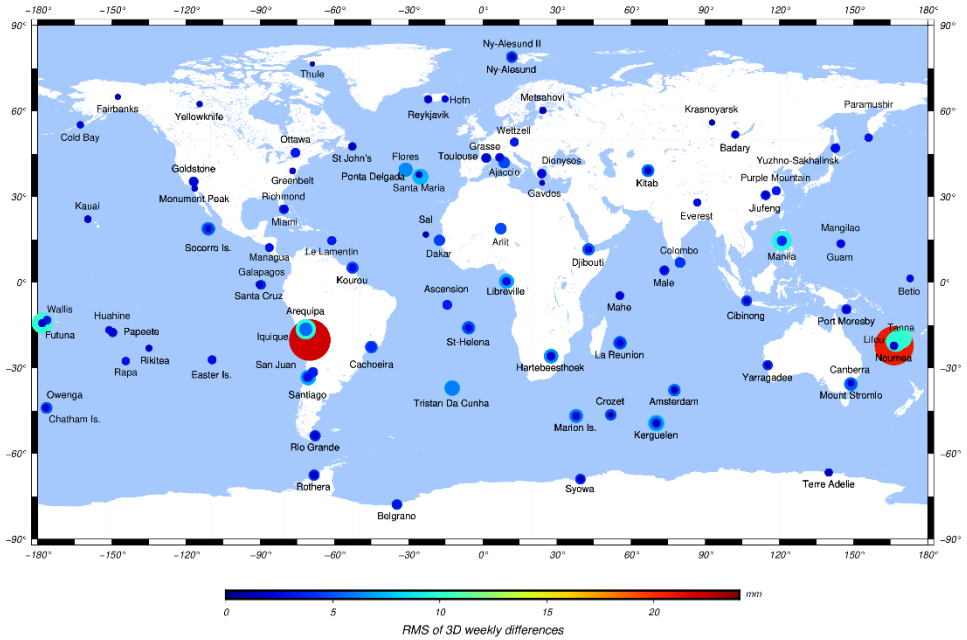


50% of the weekly 3D differences are smaller than 5 mm.
Largest differences

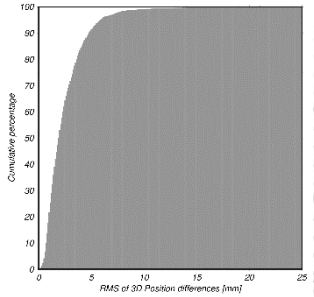
- ✓ **Paramushir, Iquique (very short time span).**
- ✓ **Socorro Island (one velocity vector for all the time segments in ITRF2020).**
- ✓ **Crozet (CRQC – smaller DORIS tie residuals for DPOD2020).**

DPOD2020 v3.0 vs DPOD2020 v2.0

Weekly station coordinate differences between DPOD2020 v3.0 and DPOD2020 v2.0 from 1993.0 to 2024.0.
Without annual and semi-annual corrections.



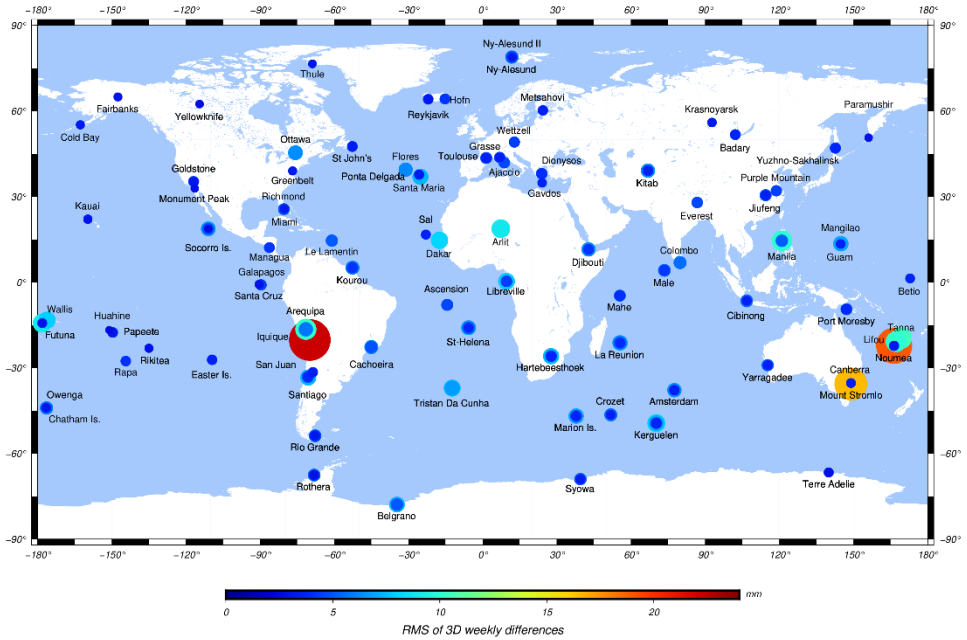
	[mm]
Max	39.6
Median	1.9
RMS	3.2
Mean	2.5
STD	2.1



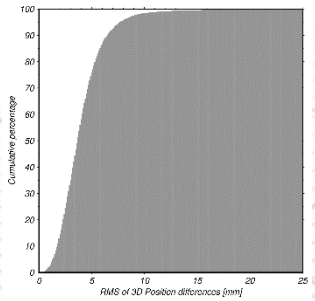
92% of the weekly 3D differences are smaller than 5 mm.
Largest differences are located at Lifou and Iquique, sites with very short time spans and for which we did not estimate periodic terms in version 3.0 as the sites were turned off before mid-2002.

DPOD2020 v3.0 vs DPOD2020 v2.0

Weekly station coordinate differences between DPOD2020 v3.0 and DPOD2020 v2.0 from 1993.0 to 2024.0.
With annual and semi-annual corrections.



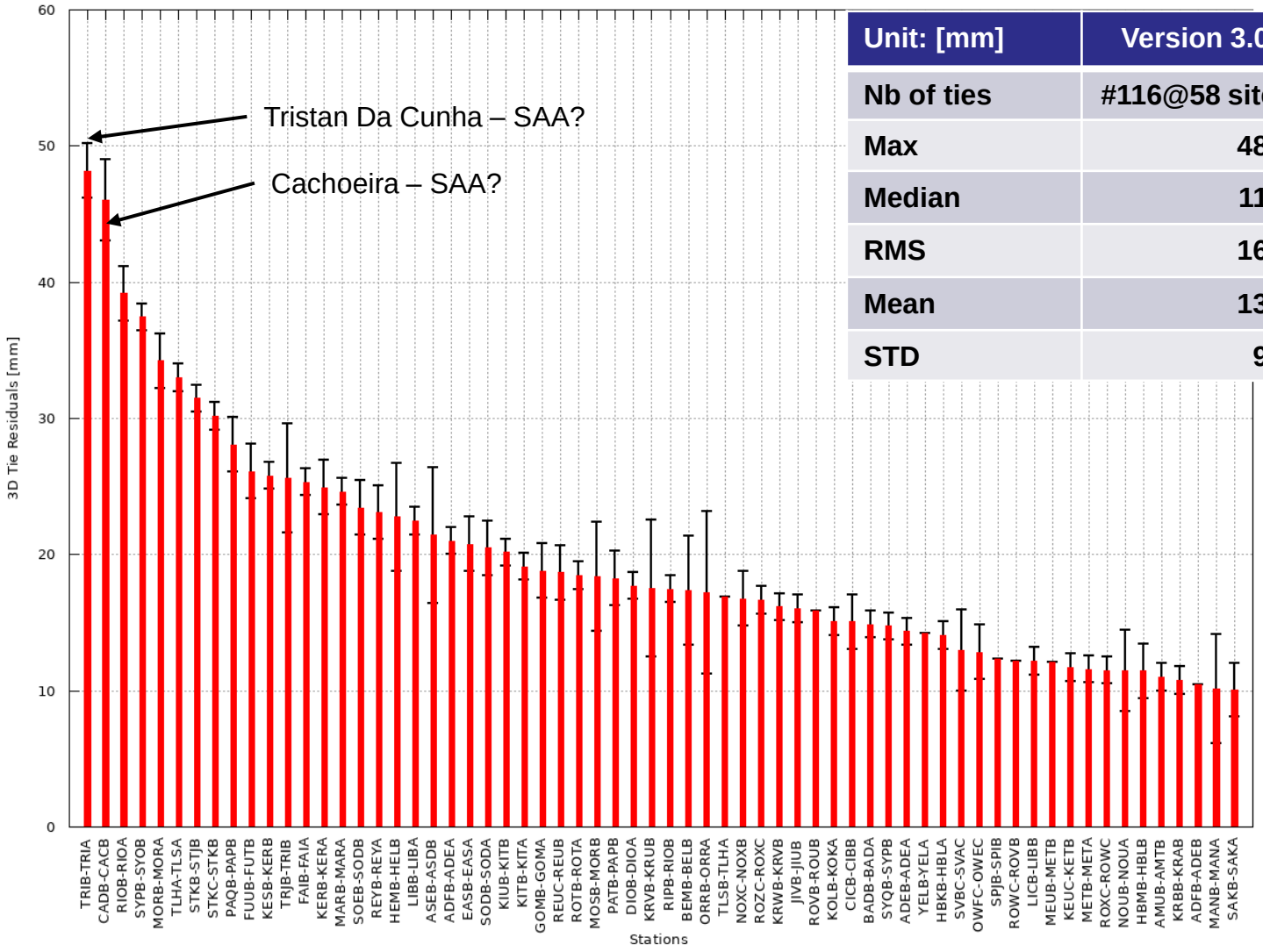
	[mm]
Max	39.6
Median	3.7
RMS	4.7
Mean	4.9
STD	2.3



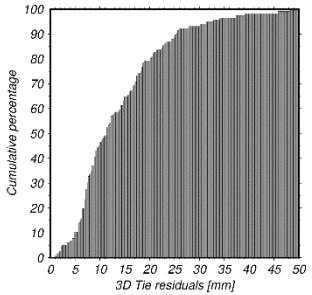
78% of the weekly 3D differences are smaller than 5 mm.
Largest differences are located at Canberra, Lifou, Iquique, sites with very short time spans and for which we did not estimate periodic terms in version 3.0 as the sites were turned off before mid-2002.

DPOD2020 v3.0 vs IGN DORIS-to-DORIS ties

Coordinate differences estimated at the date of the surveyed ties

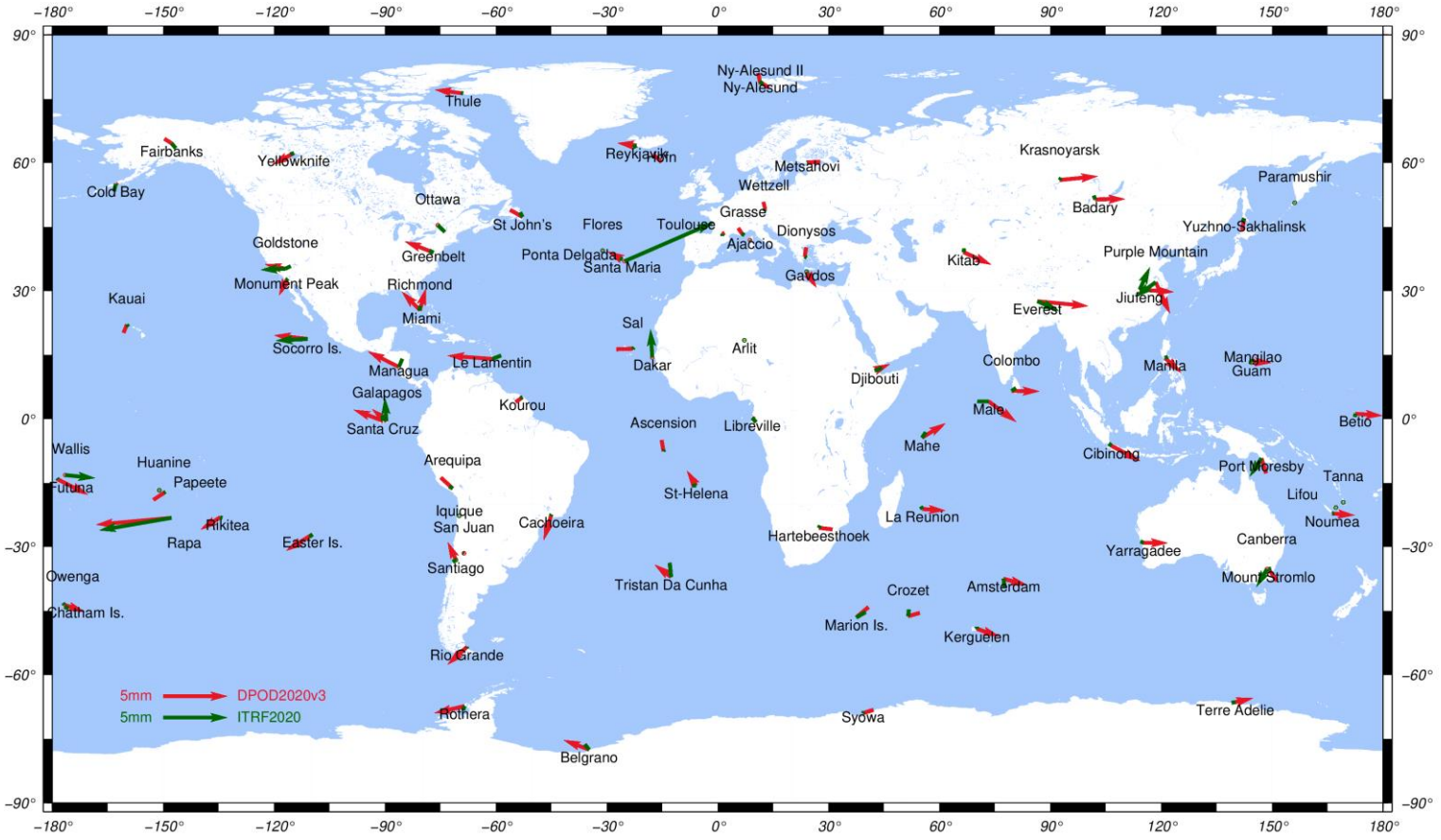


Unit: [mm]	Version 3.0	Version 2.0
Nb of ties	#116@58 sites	#114@58 sites
Max	48.1	46.2
Median	11.4	11.6
RMS	16.6	16.4
Mean	13.8	13.8
STD	9.2	9.0



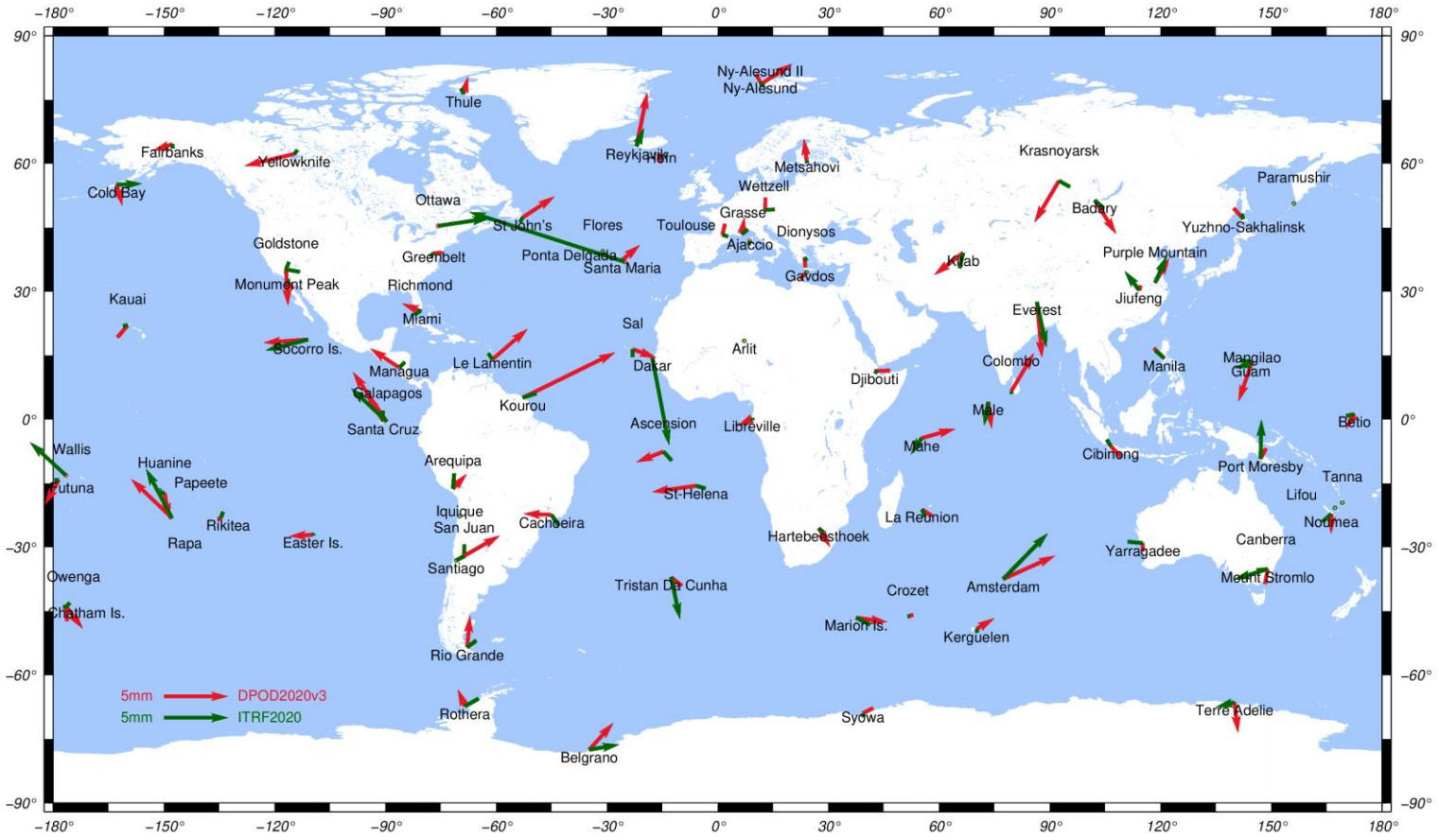
DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

East – Semi-annual terms



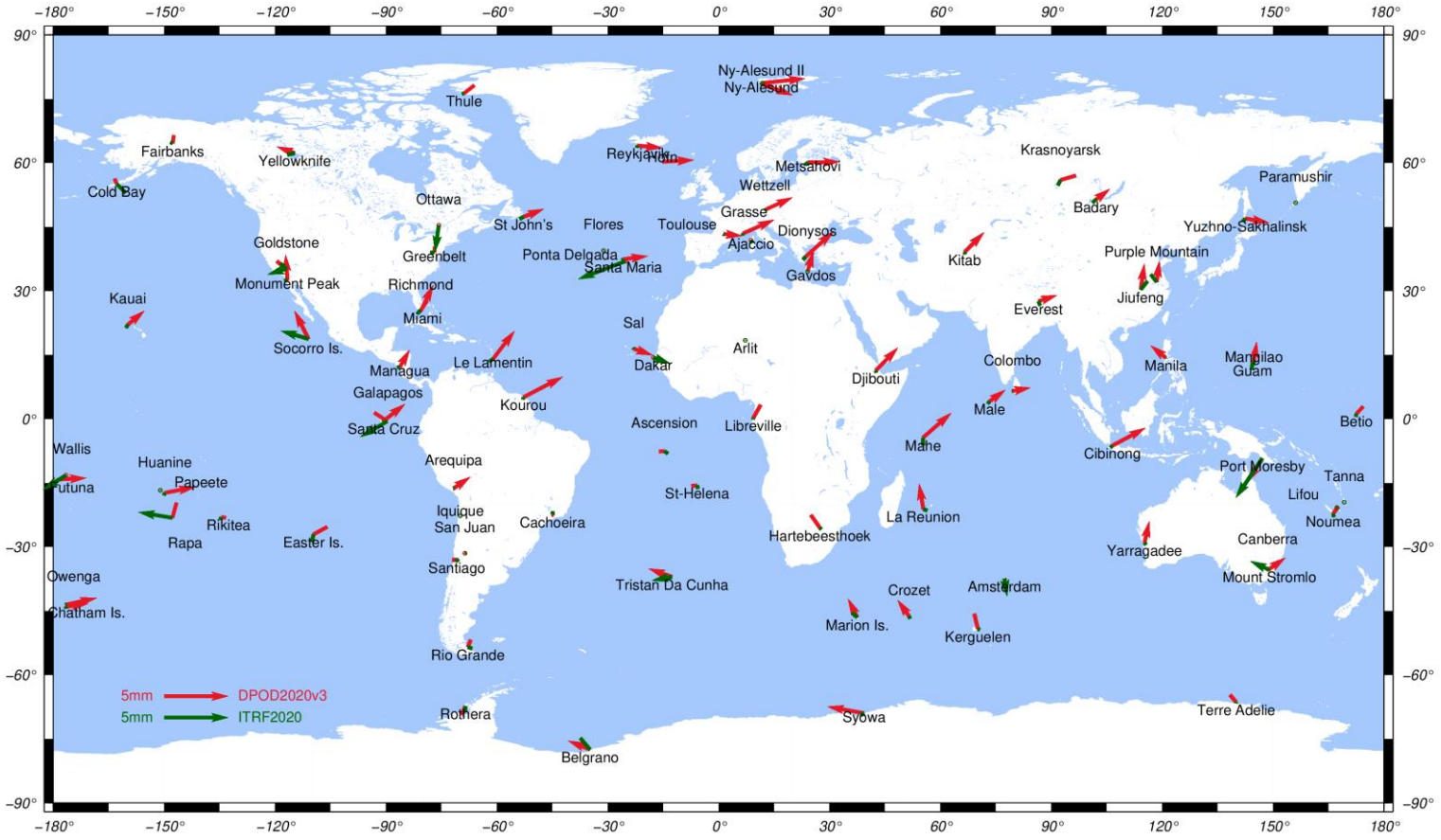
DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

East – Annual terms



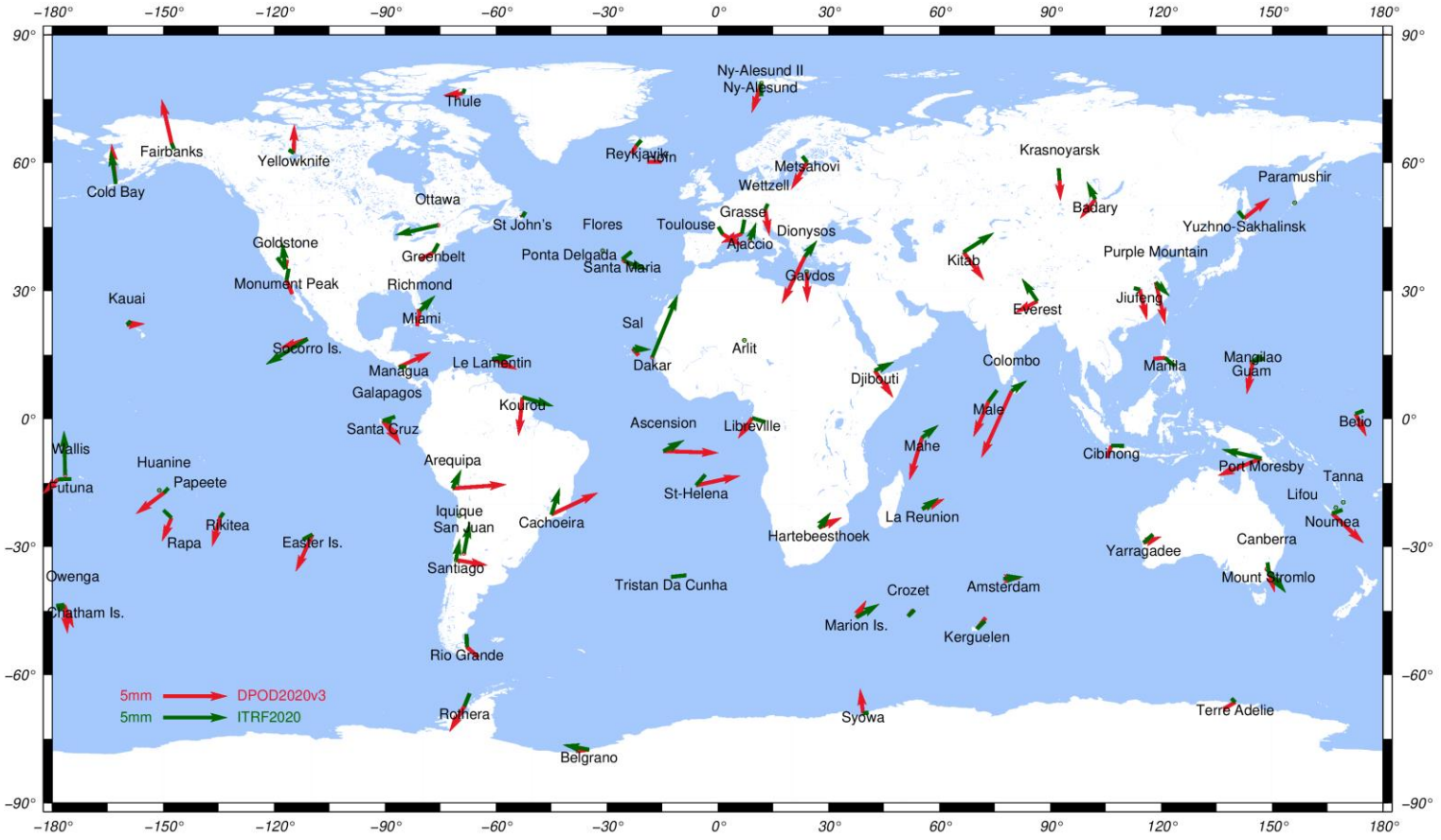
DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

North – Semi-annual terms



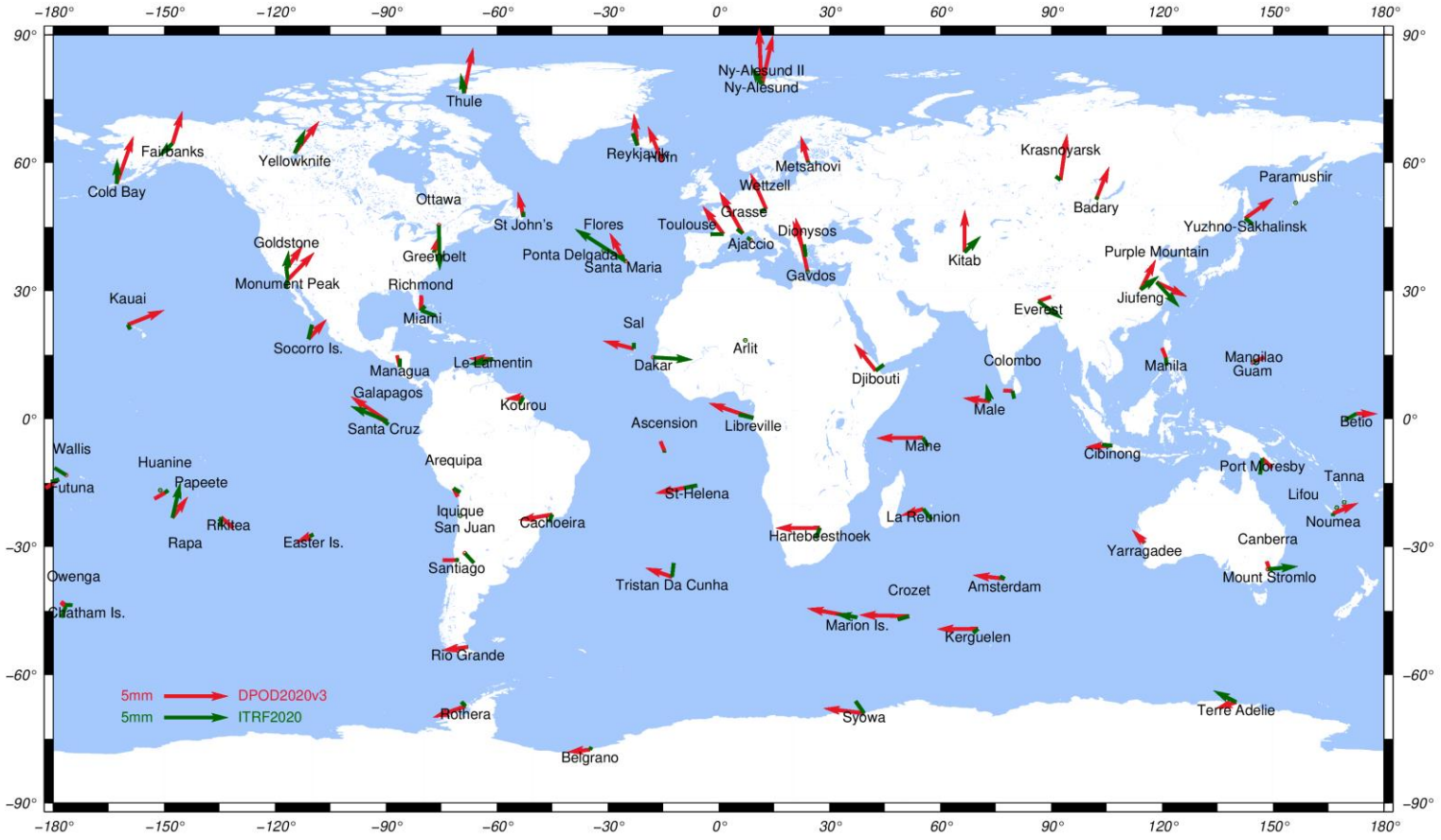
DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

North – Annual terms



DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

Up – Semi-annual terms



DPOD2020 v3.0 vs ITRF2020 CF Periodic Terms

Up – Annual terms