

# **INA AC reprocessing for ITRF2014 (main results)**

*S.Kuzin, S.Tatevian*

*Institute of Astronomy RAS*

# Solutions delivered to IDS and ITRF2014 (as 1 May 2015)

**inawd08 time series (22 years)**

**1) 1993.0 – 2014.0 for ITRF2013**

**plus**

**2) 2014.0 – 2014.75 for ITRF2014**

**3) 2014.75 – 2015.0 for ITRF2014**

The main improvements in the inawd08 solutions, submitted to IDS for ITRF2014 validation, compare to the previous ones (inawd07 for ITRF2008) connected with the use of:

- a new gravity field model; now INA is using the GOCO02S satellite-only global gravity field model, all types of tides correspond to the IERS2010 Conventions ;
- polar motion and UT1 values, taken from the IERS bulletin A (instead of the IERS bulletin B);
- models of the instruments reference points displacements correspond to the IERS2010 Conventions;
- a priori atmospheric density model DTM2000 (was DTM94);
- better troposphere mapping function, GMF model, (instead of NMF);
- elevation angle cutoff = 12 degrees, (instead of 15 degrees);
- corrected data of SPOT5 SAA (South Atlantic Anomaly) for data processing since the beginning 2006.0 onward;

**The data of majority DORIS satellites were processed except for HY2A, SARAL and JASON1  
INA AC didn't apply phase center law for ground antennas**

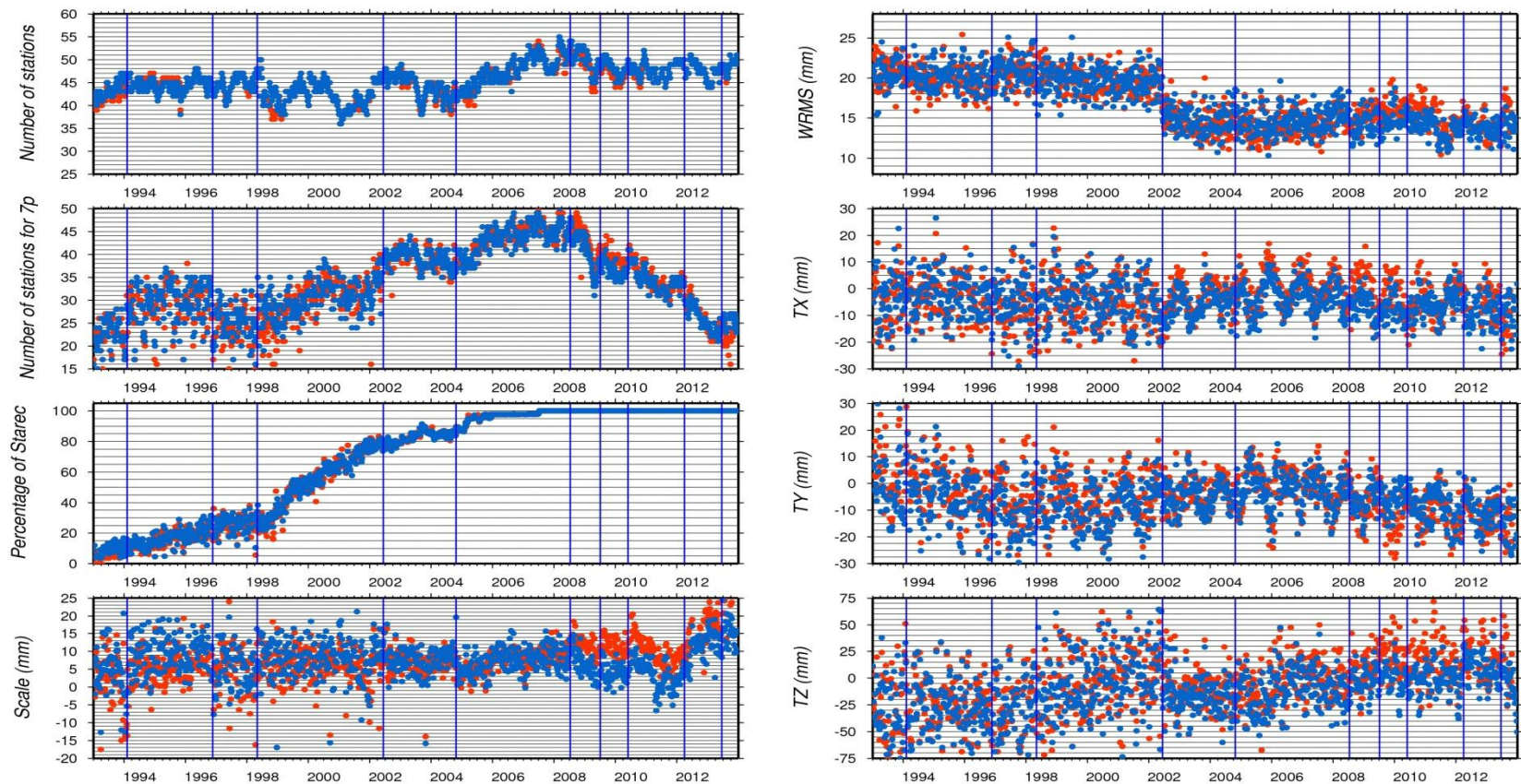
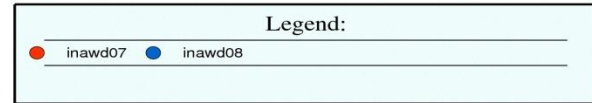
**At the same time after the final solutions delivery for ITRF2014 INA reprocessed and submitted to IDS:**

**inawd09 = inawd08 + SARAL + HY2A**

**inawd10 = inawd09 + phase law (from 1993.0 – till now, but at CDDIS currently is only last part of the solutions)**

# Weekly comparison of the INASAN inawd07 and inawd08 solutions with the ITRF2008 solution

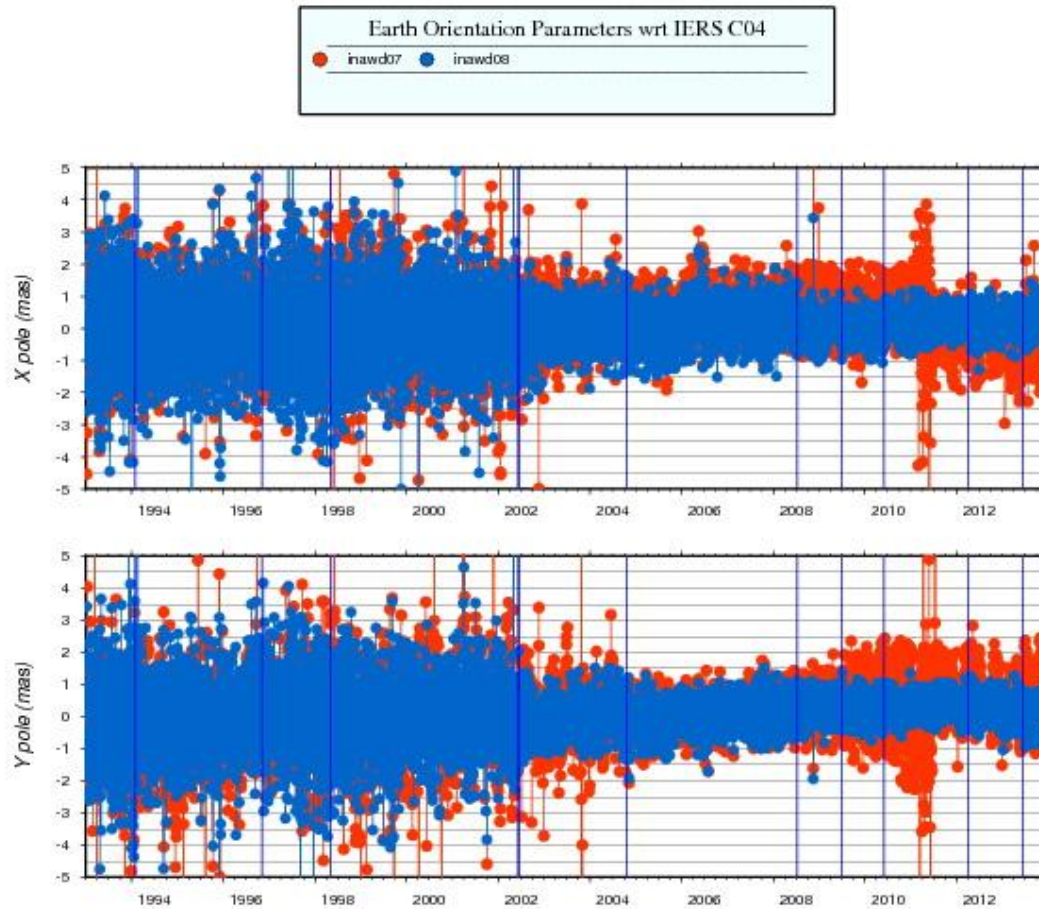
Per week comparison to ITRF2008



# Comparative statistical characteristics of the INA analysis center contribution to ITRF2008 and ITRF2014

AC series	N stations in SINEX (mean)	N stations for 7-par. estimation (mean)	WRMS (mm)	Scale (mm)	Tx (mm)	Ty (mm)	Tz (mm)
<b>ITRF2014 (1993.0 – 2014.7)</b>							
idswd07	42.38	34.83	13.68 ±1.99	12.38 ±3.58	-4.28 ±5.03	-2.39 ±5.17	-12.54 ±18.08
inawd08	45.70	37.43	21.41 ±4.38	8.98 ±5.55	-4.08 ±6.96	-7.43 ±8.31	-12.49 ±23.47
<b>ITRF2008 ( 1993.0 – 2009.0)</b>							
idswd03	39.87	37.62	13.82 ±1.99	3.29 ±4.18	- 2.49 ±5.92	-1.42 ±6.83	-16.81 ±25.17
inawd07	45.20	33.61	17.09 ±2.14	7.71 ±5.55	-3.80 ±7.81	-5.07 ±8.83	-6.06 ±24.82

# Differences of X-pole and Y-pole components of the inawd08 and inawd07 time series with respect to IERS C04 solution



# INA AC Earth Orientation Parameters wrt IERS C04

AC	Series number	Period days	X pole (mas)		Y pole (mas)	
			Mean	std	mean	std
INA	07	7519	0.198	1.186	0.034	1.226
INA	08	7637	0.062	0.941	0.065	0.852

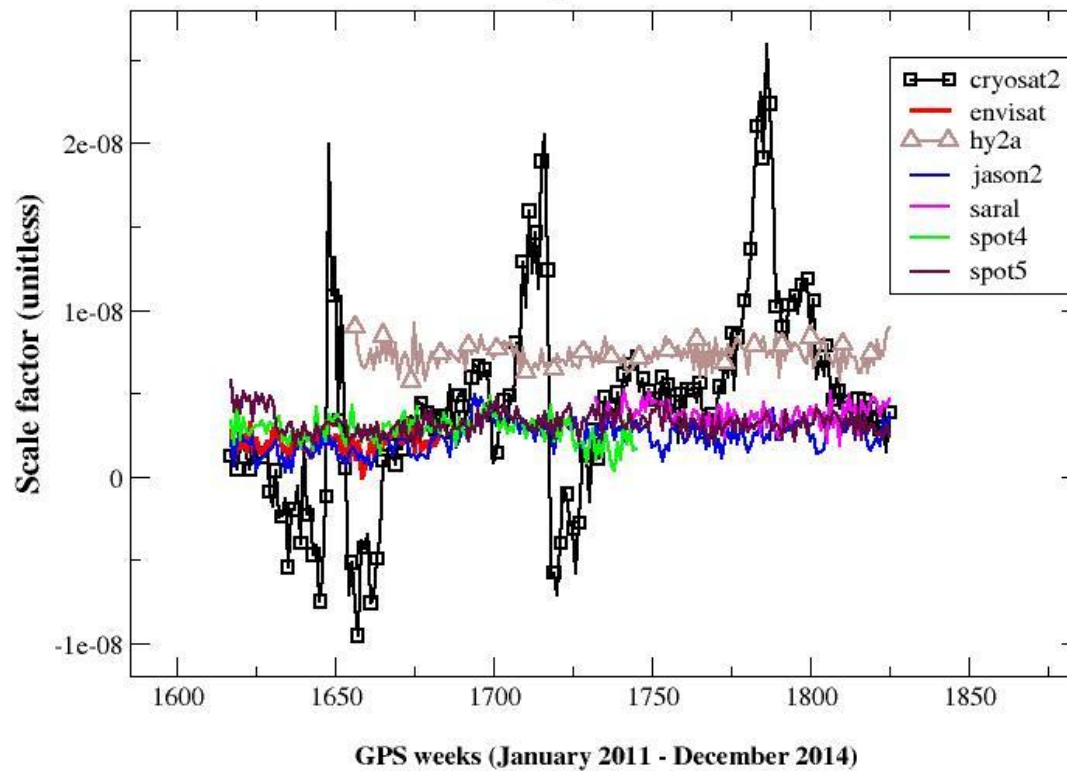


# Variations of the geocenter motion

Coordinates		Interval of processing	Annual period		Semiannual period	
		Years	<i>A, mm</i>	<i>Phase, degrees</i>	<i>A, mm</i>	<i>Phase, degrees</i>
X	DORIS (INA)	1993.0 – 2014.0	4.06 ±0.48	97.39 ±8.86	8.97 ±0.55	359.31 ±3.60
	DORIS (IGN/JPL)	1993.0 – 2013.87	4.67 ±0.21	106.34 ±4.82	10.65 ±0.31	358.53 ±1.75
Y	DORIS (INA)	1993.0 – 2014.0	4.11 ±0.15	330.57 ±7.15	5.56 ±0.32	352.01 ±4.37
	DORIS (IGN/JPL)	1993.0 – 2013.87	4.49 ±1.82	317.51 ±4.59	2.46 ± 0.33	199.50 ±3.63
Z	DORIS (INA)	1993.0 – 2014.0	0.53 ±0.19	306.59 ±19.05	9.19 ±0.87	357.35 ±5.91
	DORIS (IGN/JPL)	1993.0 – 2013.87	1.62 ±0.60	286.21 ±39.18	13.65 ±0.76	352.41 ±4.22

# Scale factor time series of the single satellite campaign for 2011-2014

TRF scale compare to DPOD2008 (v.1.13)  
inawd10: single satellite solutions

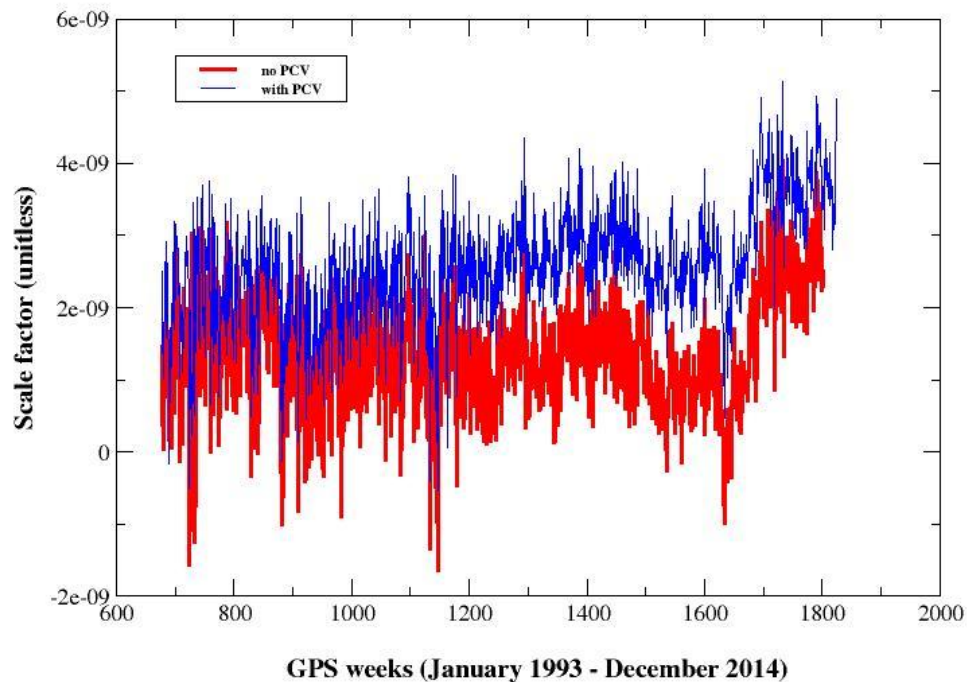


# The mean values of the scale parameter for the single satellite campaign of 2011-2014

Satellite	Mean scale value (unitless)
Cryosat2	$4.18e-09 \pm 5.99e-09$
Envisat	$2.06e-09 \pm 6.97e-10$
Hy2a	$7.26e-09 \pm 7.03e-10$
Jason2	$2.33e-09 \pm 8.84e-10$
Saral	$3.70e-09 \pm 7.13e-10$
Spot4	$2.75e-09 \pm 8.03e-10$
Spot5	$3.22e-09 \pm 7.06e-10$

# Comparison of scale factor variations for two weekly INA time series with respect to DPOD2008: inawd08 (lower line, no PCV corrections) and inawd10 (upper line, with PCV corrections)

Impact of applying ground antenna phase law on TRF scale



*Article to ASR*

*S.Kuzin, S.Tatevian*

**“Contribution of the INASAN  
DORIS Analysis Center to the IDS  
and ITRF2014”**

# **DORIS RINEX DATA PROCESSING**

**???**

# Conclusions

- **The results of inawd08 series (for ITRF2014) as compare with inawd07 ones (for ITRF2008) are a little bit worse for Helmert transformation parameters but better for polar motion**
- **Scale single satellite campaign: curious variations of the scale parameter for CRYOSAT2; scale for HY2A up-biased for about 4.00 ppb (about 24 mm) wrt other satellites**

# Conclusions (continued)

- **DORIS TRF scale parameter is significantly dependent from ground antennas PCV correction (scale offset about 1.2 ppb)**
- **Scale jump in the mid 2012 stays unresolved**
- **DORIS RINEX data processing under investigation**