GSC Analysis Center Report

GSFC POD Team

IDS Analysis Working Group Meeting

Greenbelt, Maryland

October 14-15, 2013

Summary

1. Since March 2013, All DORIS data (1993-2013) reprocessed with a series of updates to gscwd18.

2. The new series (gscwd20) includes implementation of recommendations from the AWG meeting Toulouse, implementation of the IERS 2010 standards, etc.

3. New baseline series: gscwd20. Supercedes gscwd18. Delivered to CDDIS and IGN data centers on Sept. 30, 2013. (See DORISReport 3453, Sept. 30, 2013).

4. Two test series delivered for evaluation to IDS Combination center.

GSCWD21 = GSCW20 + application of phase law (Alcatel & Starec antennae).
GSCWD20_JA1: 2004-2008. GSCWD20 + Jason-1

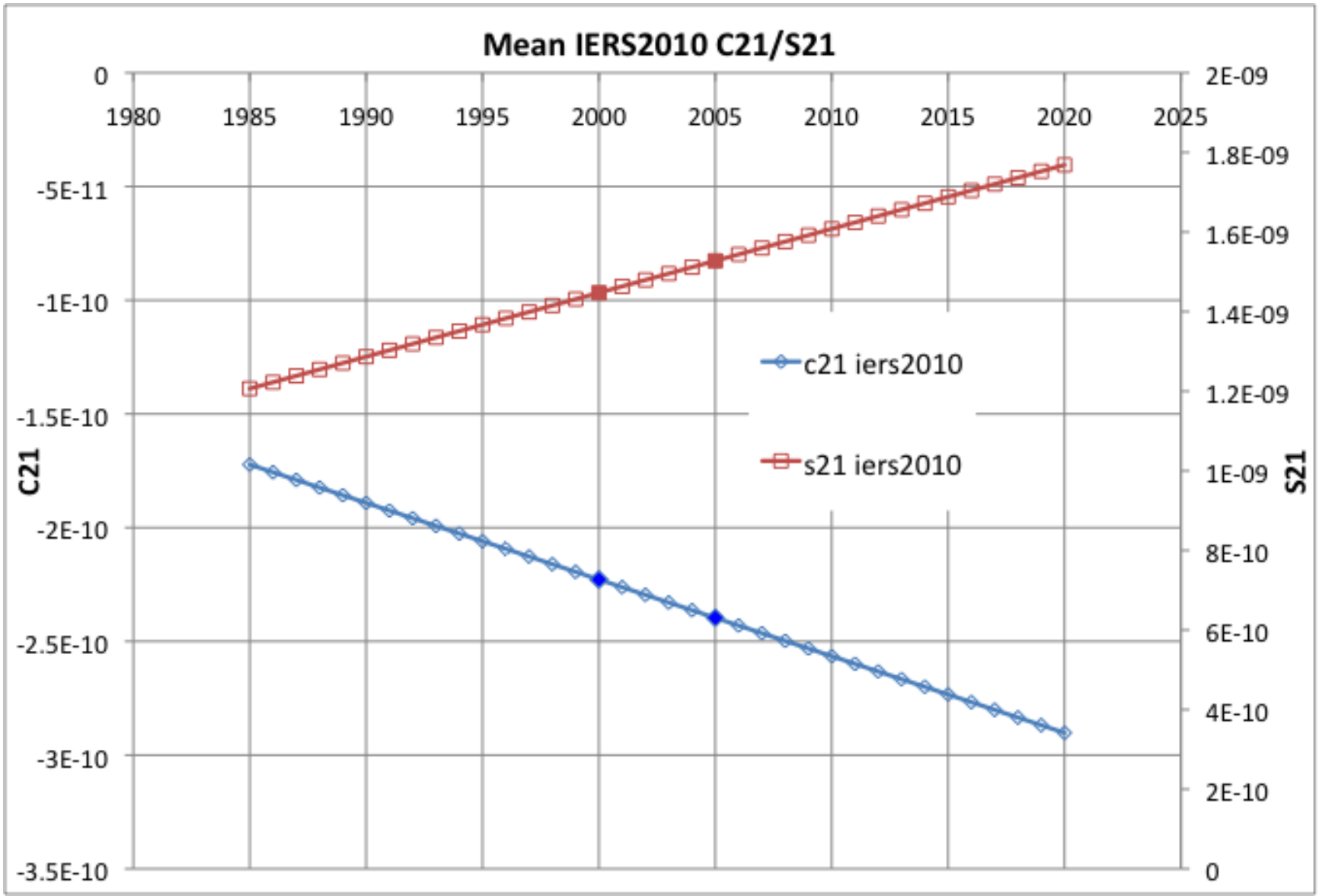
New Baseline Series (gscwd20) Changes w.r.t. gscwd18

1. **Explicit modeling of the pole according to the IERS standards 2010, (Petit and Luzum, 2010; Table 7.7, pp. 115.)**
    - Cubic model to 2010; Linear model afterwards.

2. **C21, S21 is fully compatible with this pole model and uses long-term model based on standard values of C20, C22, S22.** (equation 6.5 IERS standards 2010, pp. 81).

Long-term C21, S21 model

(From IERS 2010 Standards)



New Baseline Series (gscwd20) Changes w.r.t. gscwd18 (2)

3. New *a priori* **DORIS station set (DPOD2008v1.12). Brings in data from newer stations towards the end of the series.**

4. Explicitly deleted in POD computations those stations with < 250 observations/week. (In gscwd18, these stations were deleted at the normal equation stage**).**

5. A DORIS timing bias model was added for TOPEX/Poseidon, based on SLR/DORIS solutions.

6. Use quaternions from E.J.O. Schrama to model attitude of Cryosat-2.

New Baseline Series (gscwd20) Changes w.r.t. gscwd18 (3)

7. More frequent cd adjustments as per recommendations of Laurent Soudarin; This affected the lower satellites: SPOT-2,3,4,5; Envisat, Cryosat-2.

8. "Newly ascertained" Pitch changes in Solar array of SPOT-5 (after March 2012).

9. Many week-by-week arc setup cleanups to avoid lengthy periods with no data in beginning, end or middle of arcs.

New Baseline Series (gscwd20) Changes w.r.t. gscwd18 (4)

10. In weekly normal equations, satellite contributions had the following NEQ scale factors:

TOPEX	9.68980
SPOT-2	11.5398
SPOT-3	10.2811
SPOT-4	11.8906
SPOT-5	13.5913
ENVISAT	9.99860
CRYOSAT2	12.7550
JASON-2	17.6356

These scale factors are wrt. the GEODYN POD data weight of 2 mm/s, and as a result the effective data weight in the weekly solutions is closer to the intrinsic RMS of fit, by satellite, allowing for some residual systematic error.

→ This should be noticeable in the std deviations in the STCD plots for this series.

New Baseline Series (gscwd20) Changes w.r.t. gscwd18 (4)

11. Use SPOT-5 SAA Corrected DORIS data (2006-2013.0).
    (Data for 2013/SPOT-5 not yet processed; waiting for data).

New Baseline Series (gscwd20)
Other features (same as gscwd18)

1. Beacon frequency changes at DORIS sites fully accounted for.
2. Macromodels for DORIS satellites as in gscwd18 series (see April 2013 GSC AWG presentation for details).
3. Geopotential model: GOCO02s (GRACE + GOCE model) + harmonic fit to 4x4 SLR-DORIS time series (Lemoine et al., 2011).

Summary of gscwd21 series

1. Baseline is gscwd20 series.
2. Apply explicitly the DORIS offsets in GEODYN (using specified DORIS offsets on satellites, antenna height, and Satellite C.O.M. information, combined with attitude model).

   (This is necessary in order to apply the phase laws …)
3. Apply Phase Laws for Starec and Alcatel Antennae.

Summary of gscwd20_ja1 series

1. Baseline is gscwd20 series.
2. 2004-2008 only. Use SAA-corrected data for Jason-1.
3. Apply H. Capdeville weighting scheme for SAA stations in POD.
4. At the normal equation stage, allow the Jason-1 SAA stations to adjust independently (they do not contribute to the global solution).

RMS of fit for DORIS satellites

Satellite	wd18	wd20	wd21
	(mm/s)		
Envisat	0.494	0.500	0.492
TOPEX	0.512	0.512	0.513
Jason2	0.382	0.375	0.378
Cryosat2	0.443	0.412	0.413
SPOT-2	0.477	0.475	0.476
SPOT-3	0.499	0.499	0.500
SPOT-4	0.473	0.473	0.473
SPOT-5	0.435	0.433	0.433
Jason-1	0.347	0.327¶	------
¶ Handling of SAA stations not same for Jason-1 between wd18 & wd20.			

Future Plans

1. **Implement any corrections to wd20/wd21 processing. Complete quality control of delivered SINEX's.**

2. **Determine if a different (less conservative) SAA data weight on Jason-1 would improve Station determination/Reference Frame parameter performance.**

3. **Compute two more series for use in ITRF2013:**
   wd22 (1993-2013.0) = wd21 + apply new 5x5 (15satellite) Time-variable gravity (TVG) SLR/DORIS time series (*instead of harmonic fit to previous 4x4 (11 satellite) TVG SLR/DORIS time series).*
   wd23 (2004-2008) = wd22 + Jason-1/SAA.

Approximate time for computations and validation (1993-2013.0): ~4-5 weeks maximum.