Status of Orbit Comparisons and Analysis Issues: Nov 2008

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Outline

Summary of Orbit Comparisons:

- 2005
- 1994
- Conclusion

Macromodel tests with SPOT-3

ENVISAT Orbit series

GSFC:	GGM02c (baseline)
	GGM02c (UCL)
	GGM02c (UCL, 10° elcut)
IGN2:	ign_2_envisat_2005_*doy*.sp3
GOP:	gopenv01.05*doy*.sp1.001
ESOC:	*yydoy*.env.v2.sp1a
INA2:	ina2_envisat_2005_*doy*.sp1
LCA4:	lcaen102.*byydoy.eyydoy*.sp1.001
LCA5:	lcaen103.*byydoy.eyydoy*.sp1.001
AUS5:	orbfil.dat.*yydoy (version5)*

Software:

IGN & INA: Gypsy

GSFC & GAU: GEODYN

LCA: GINS

GOP: Bernese.

ESOC: NAPEOS

ENVISAT: RMS Orbit Differences (2005) (cm)

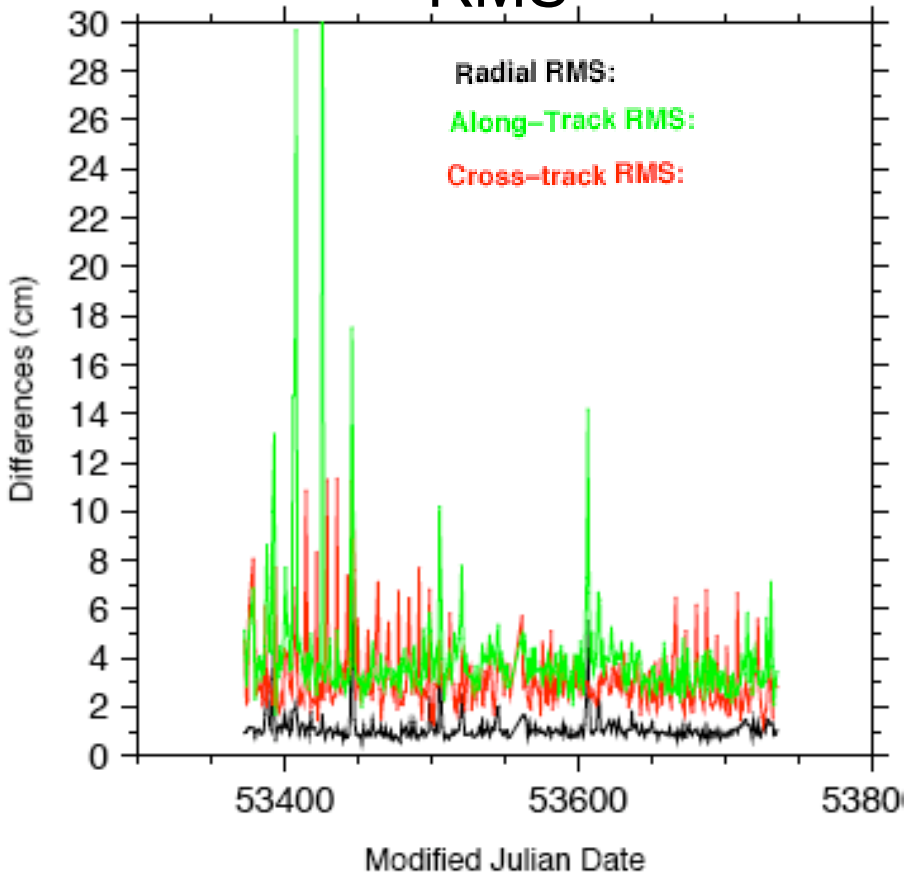
Series Compared	Radial	Cross-tr.	Along-tr.	Narc
AUS5 vs GSFC-base.	0.86	2.57	2.32	52
AUS5 vs ESOC	1.19	5.35	4.61	318
AUS5 vs GOP	2.02	4.50	6.27	25
AUS5 vs IGN2	1.50	5.28	3.98	274
ESOC vs LCA5	1.14	50.41	12.25	324
ESOC vs GSFC-UCL10	1.15	5.51	4.47	351
GOP vs. GSFC-UCL10	2.05	4.87	8.82	28
GOP vs. IGN2	1.87	4.33	6.48	24
IGN2 vs. GSFC-base.	1.42	3.60	4.74	274
IGN2 vs. LCA5	1.48	5.21	56.08	278
INA2 vs. GSFC-UCL10	1.36	4.40	4.89	280
LCA4 vs. GSFC-base.	5.79	50.16	14.60	105
LCA5 vs. GSFC-base.	1.32	50.79	13.66	104

ENVISAT: RMS Orbit Differences (2005) (cm)

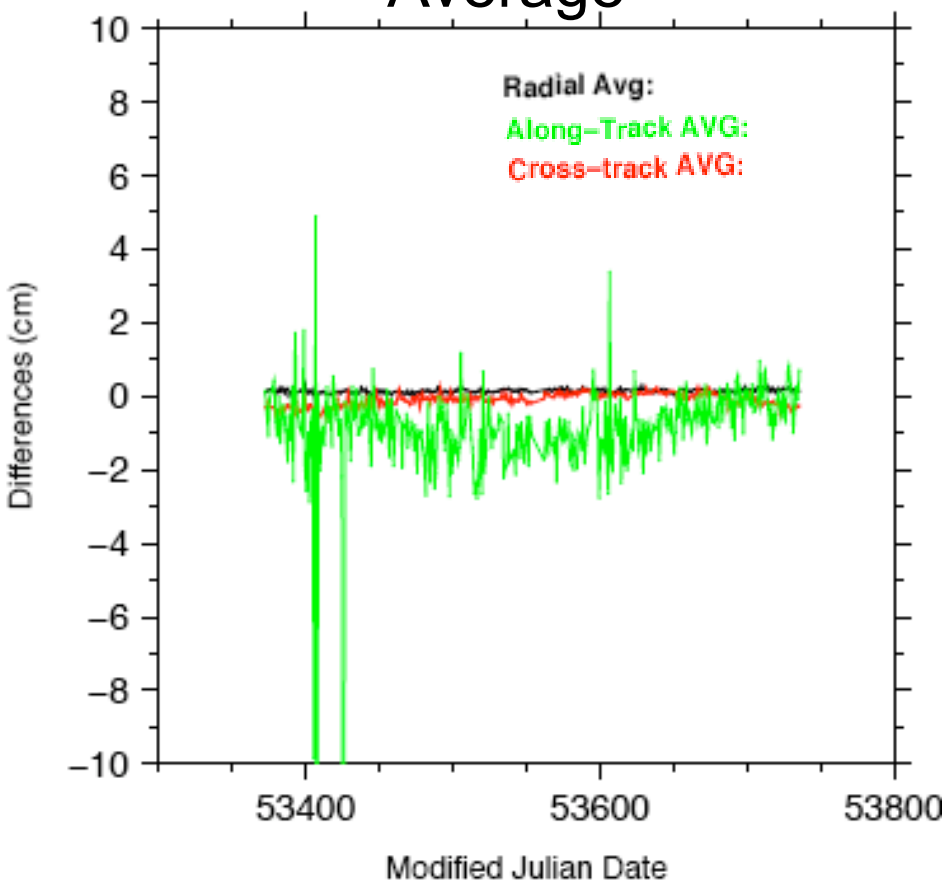
Series Compared	Radial	Cross-tr.	Along-tr.	Narc
GSFC-base. Vs GSFC-UCL	0.64	3.23	1.32	50
GSFC-UCL vs. GSFC-UCL10	0.18	1.43	0.82	63

ENVISAT Orbit Diffs: ESOC vs AUS5

RMS

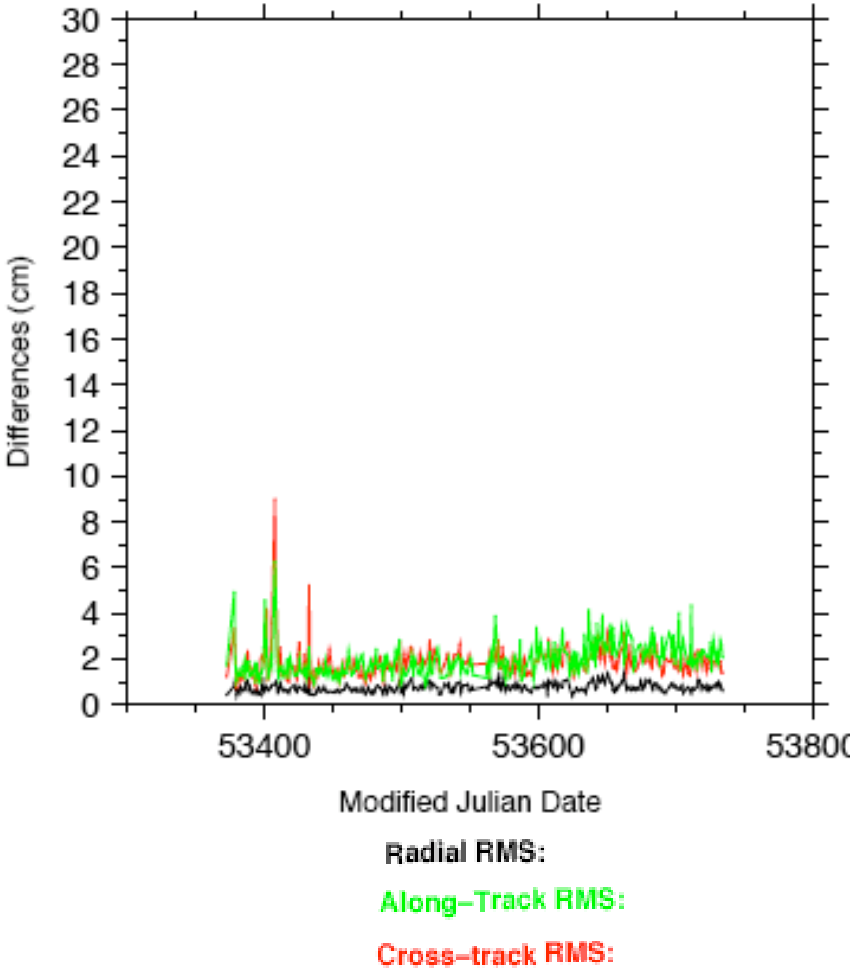


Average

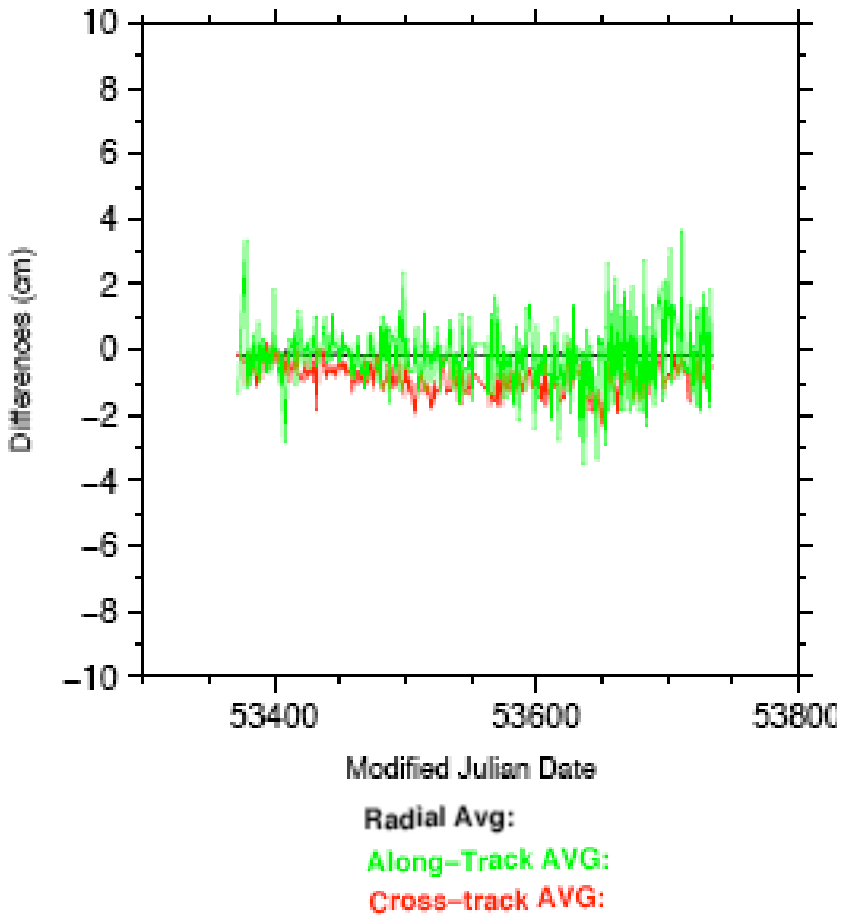


ENVISAT Orbit Diffs: IGN2 vs INA2

RMS

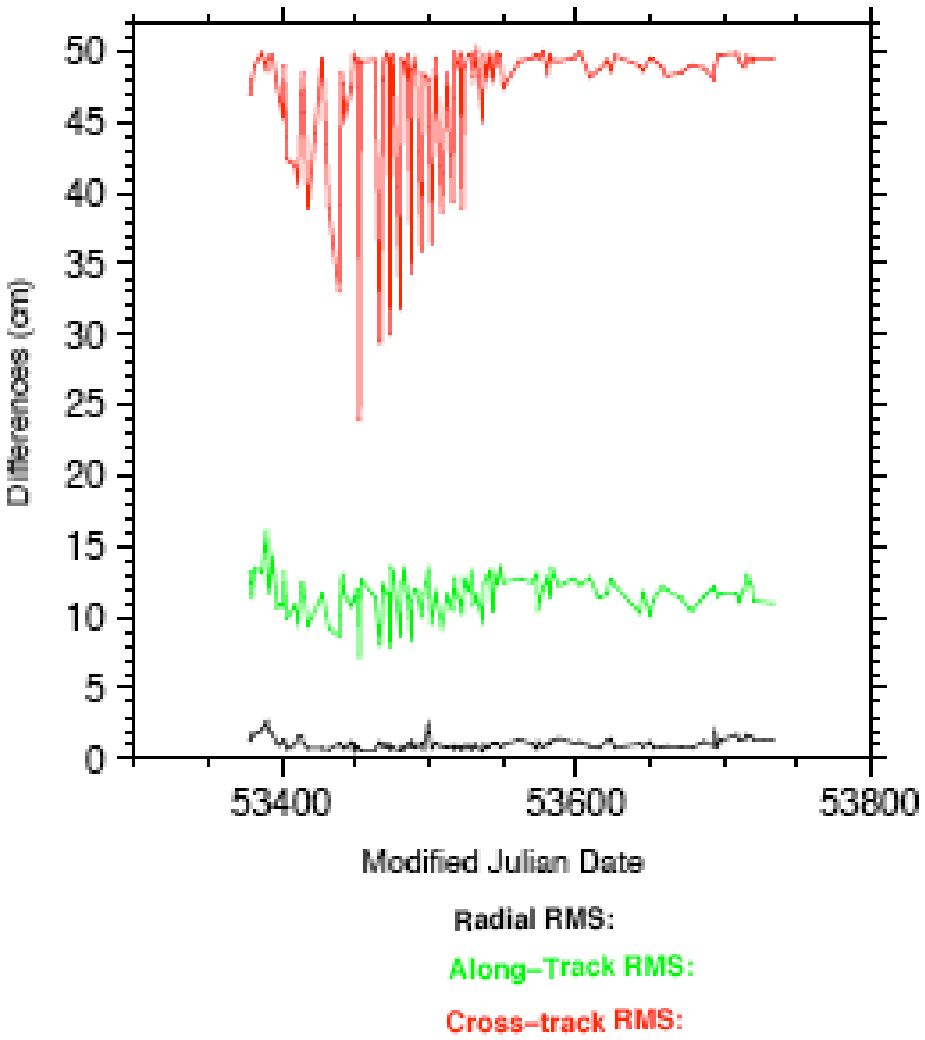


Average

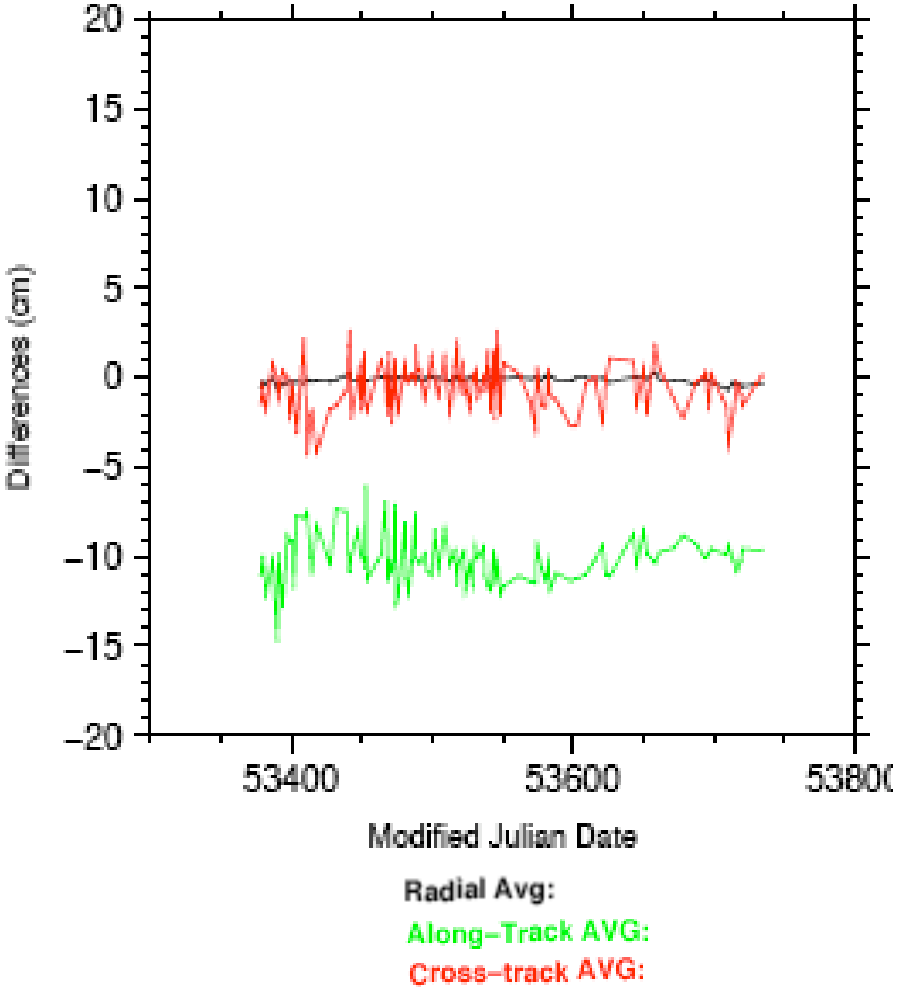


ENVISAT Orbit Diffs: LCA5 vs ESOC

RMS



Average

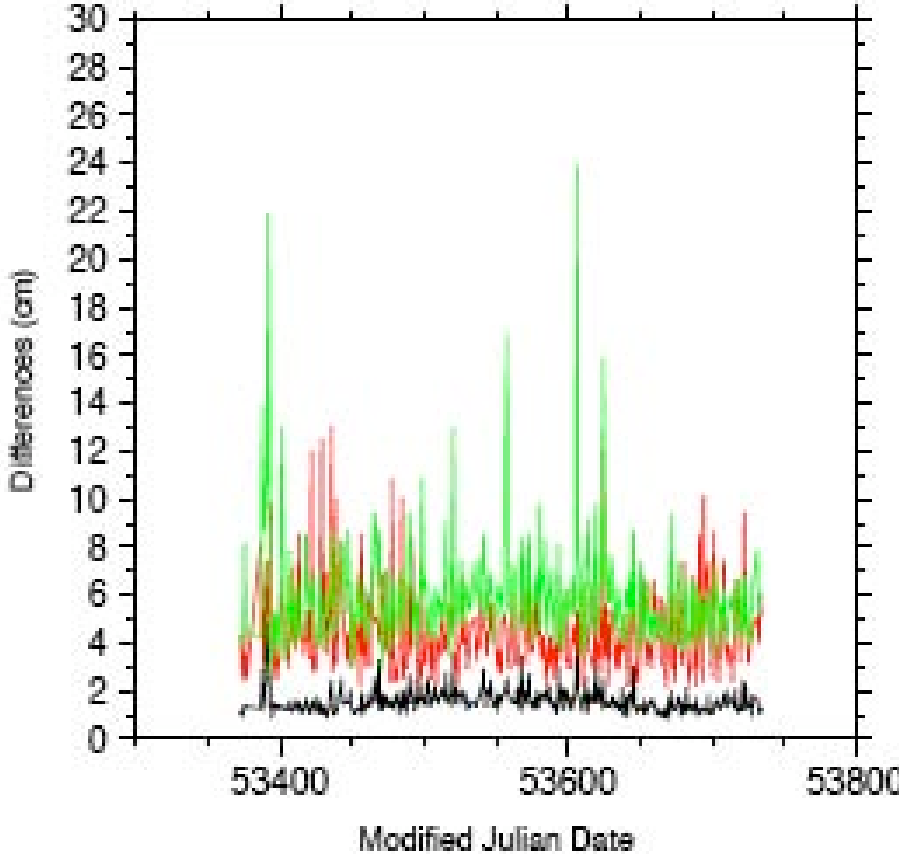


SPOT2: RMS Orbit Differences (2005) (cm)

Series Compared	Radial	Cross-tr.	Along-tr.	Narc
AUS5 vs GSFC-base.	0.57	2.52	3.83	43
AUS5 vs IGN2	1.35	5.55	4.38	311
GOP vs GSFC-10dg	1.92	5.13	8.22	20
GOP vs IGN2	2.13	4.99	7.32	19
IGN2 vs GSFC-base	1.34	3.93	5.52	347
IGN2 vs INA2	0.91	2.10	2.23	344
INA2 vs GSFC-10dg	1.55	4.47	5.76	333
LCA vs GSFC-base.	1.02	3.16	4.64	95

SPOT-2 Orbit Diffs: GSFC-10dg vs INA2

RMS

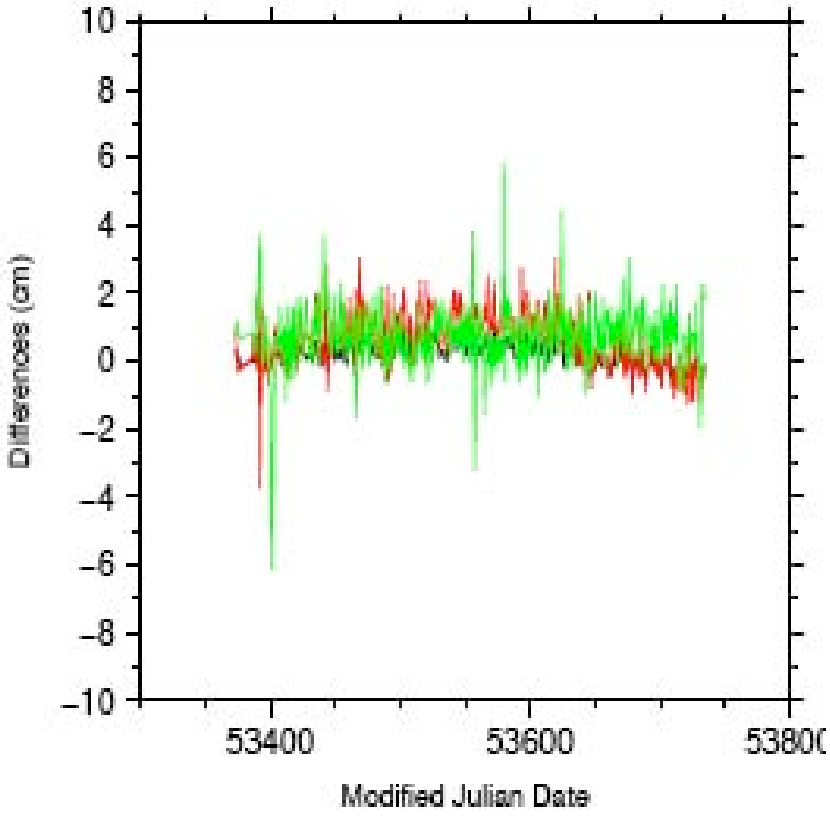


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



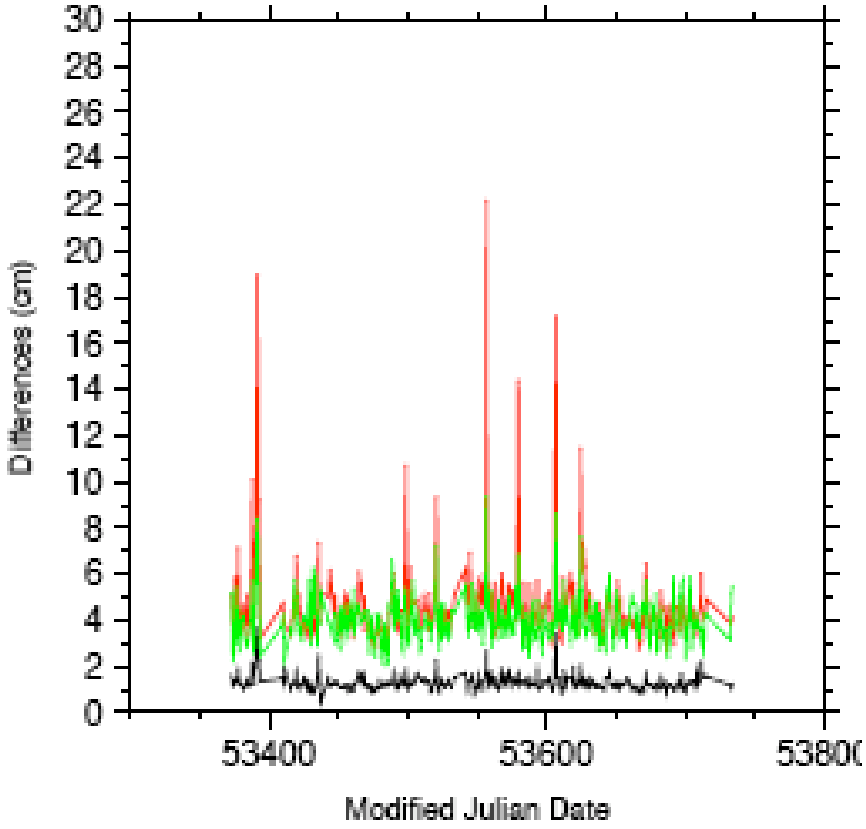
Radial Avg:

Along-Track AVG:

Cross-track AVG:

SPOT-2 Orbit Diffs: AUS5 vs IGN2

RMS

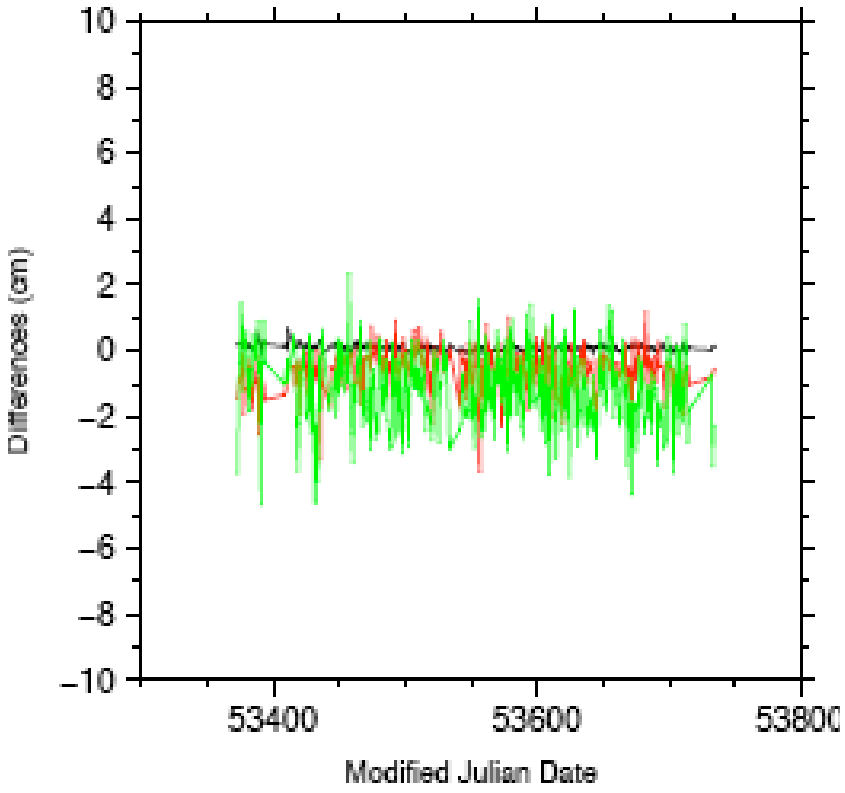


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



Radial Avg:

Along-Track AVG:

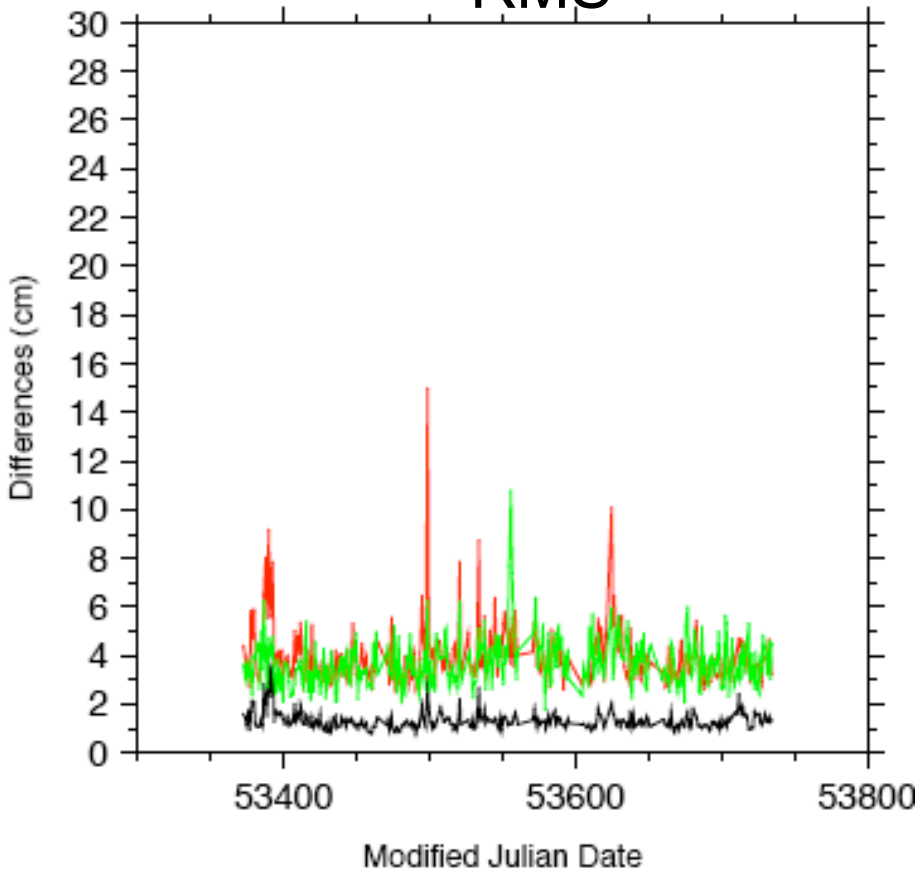
Cross-track AVG:

SPOT4: RMS Orbit Differences (2005) (cm)

Series Compared	Radial	Cross-tr.	Along-tr.	N
AUS5 vs GSFC-base.	0.45	2.31	1.41	49
AUS5 vs GOP	1.79	4.92	6.66	32
AUS5 vs IGN3	1.28	4.32	3.92	339
GOP vs GSFC-10dg	1.77	5.10	6.79	31
IGN3 vs GSFC-base.	1.29	4.33	4.38	356
GOP vs IGN3	1.97	4.82	6.67	30
IGN3 vs LCA	1.32	3.92	3.70	322
INA2 vs GSFC-10dg	1.44	4.14	4.85	287

SPOT-4 Orbit Diffs: IGN3 vs LCA

RMS

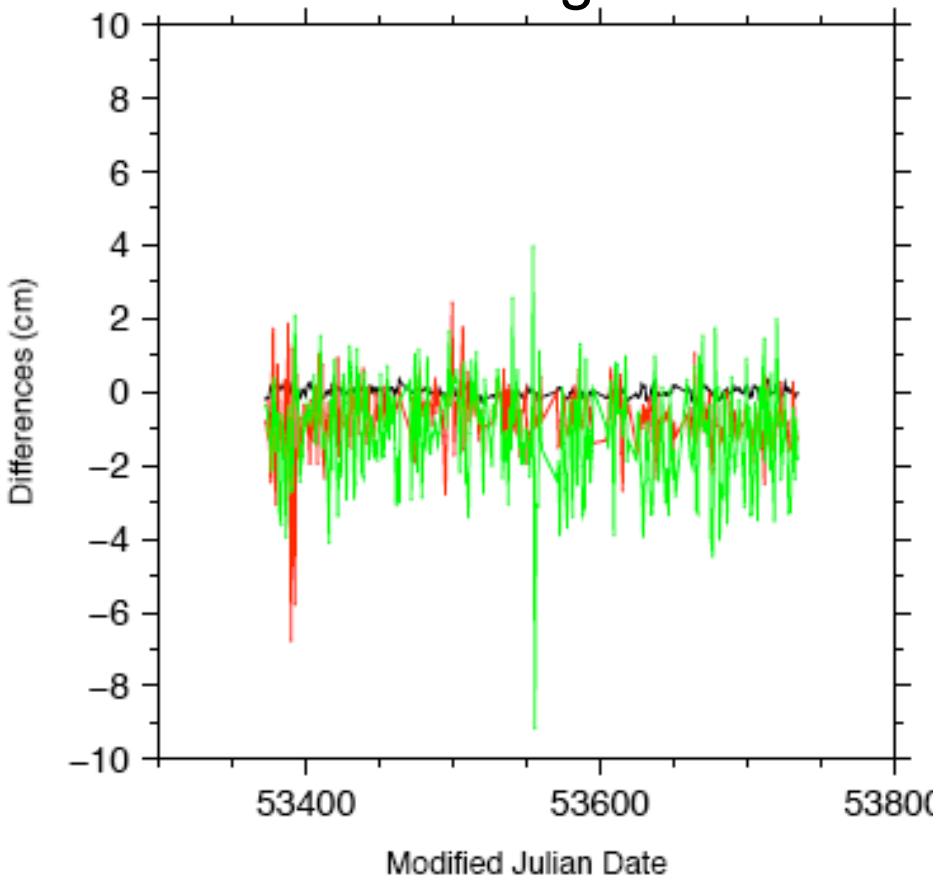


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



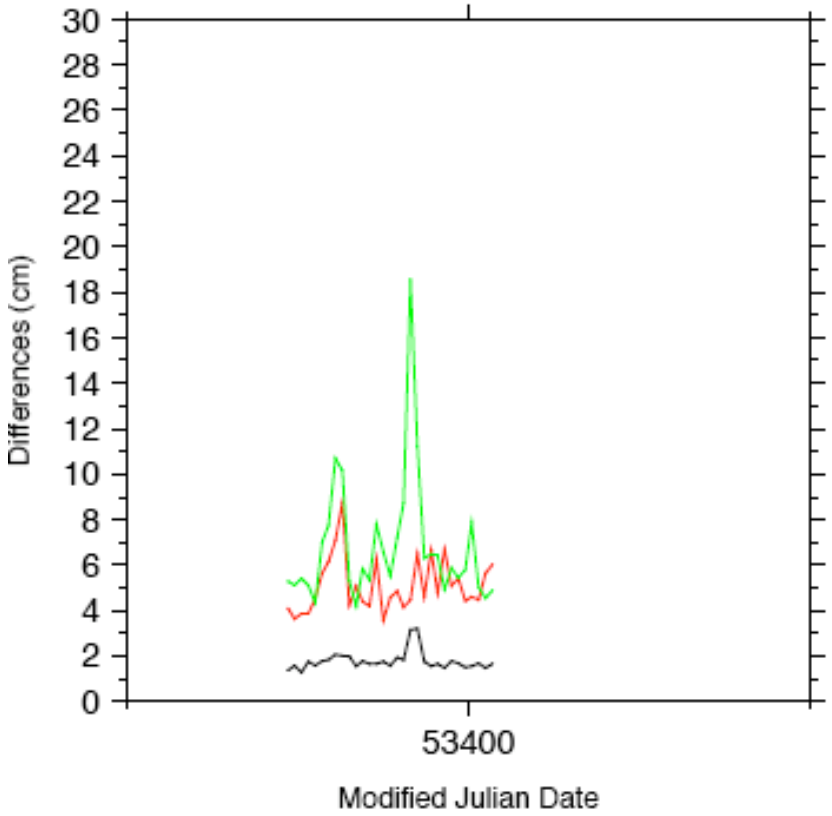
Radial Avg:

Along-Track AVG:

Cross-track AVG:

SPOT-4 Orbit Diffs: GOP vs GSFC-10dg

RMS

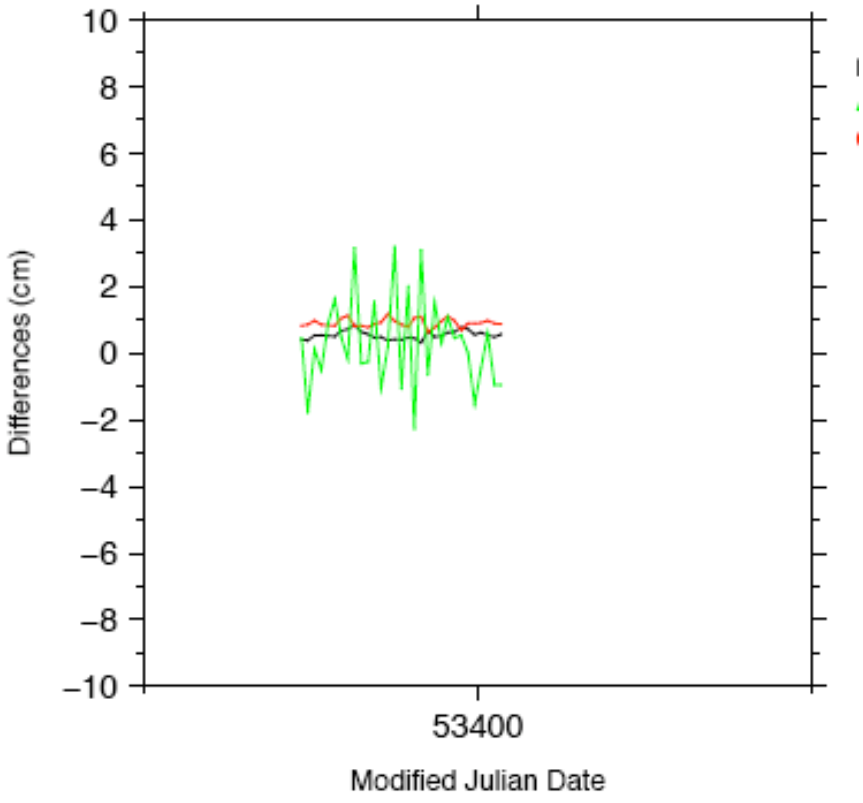


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



Radial Avg:

Along-Track AVG:

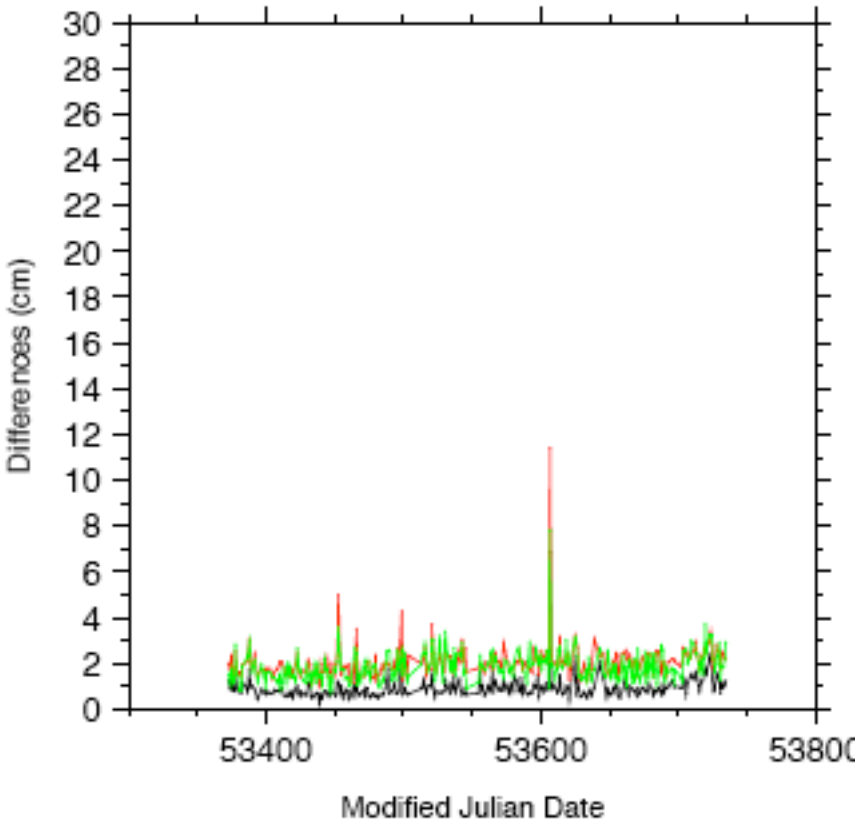
Cross-track AVG:

SPOT5: RMS Orbit Differences (2005) (cm)

Series Compared	Radial	Cross-tr.	Along-tr.	N
AUS5 vs GSFC-base.	0.36	2.20	1.26	48
AUS5 vs GOP	1.54	4.60	5.44	27
AUS5 vs IGN3	1.25	4.33	3.59	328
GOP vs GSFC-10dg	1.51	4.68	5.37	30
IGN3 vs GSFC-base.	1.29	4.33	4.38	356
GOP vs IGN3	1.69	4.44	5.44	28
IGN3 vs GSFC-base.	1.26	3.77	4.47	359
IGN3 vs INA2	0.93	2.04	1.89	285
IGN3 vs LCA	1.23	3.62	3.20	312
INA2 vs GSFC-10dg	1.39	4.13	4.57	287

SPOT-5 Orbit Diffs: IGN3 vs INA2

RMS

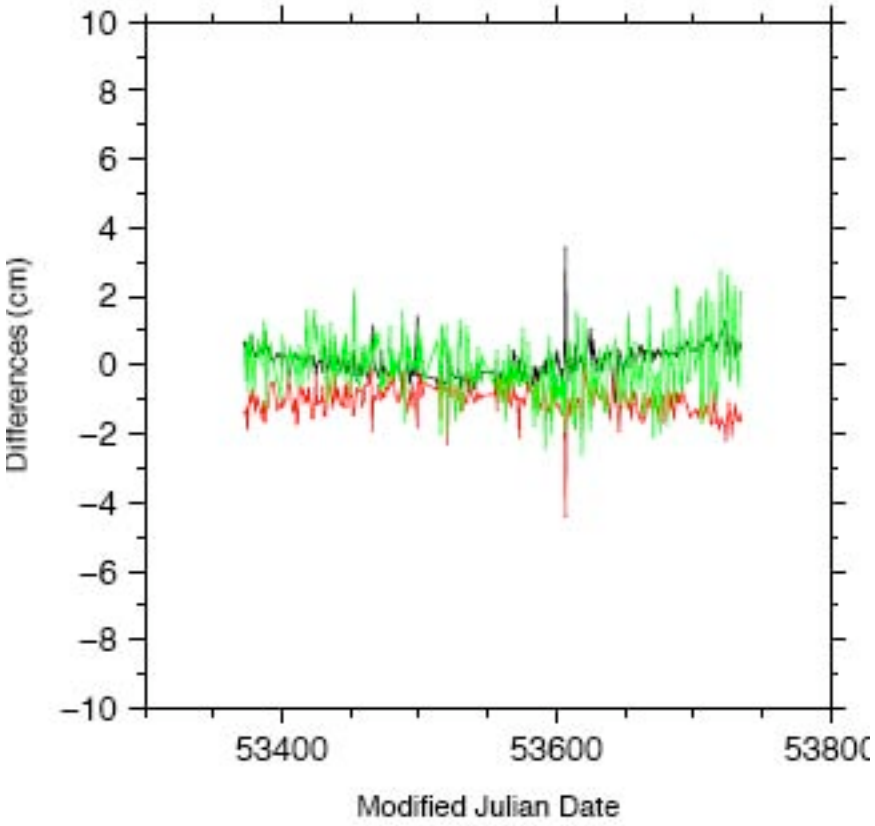


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



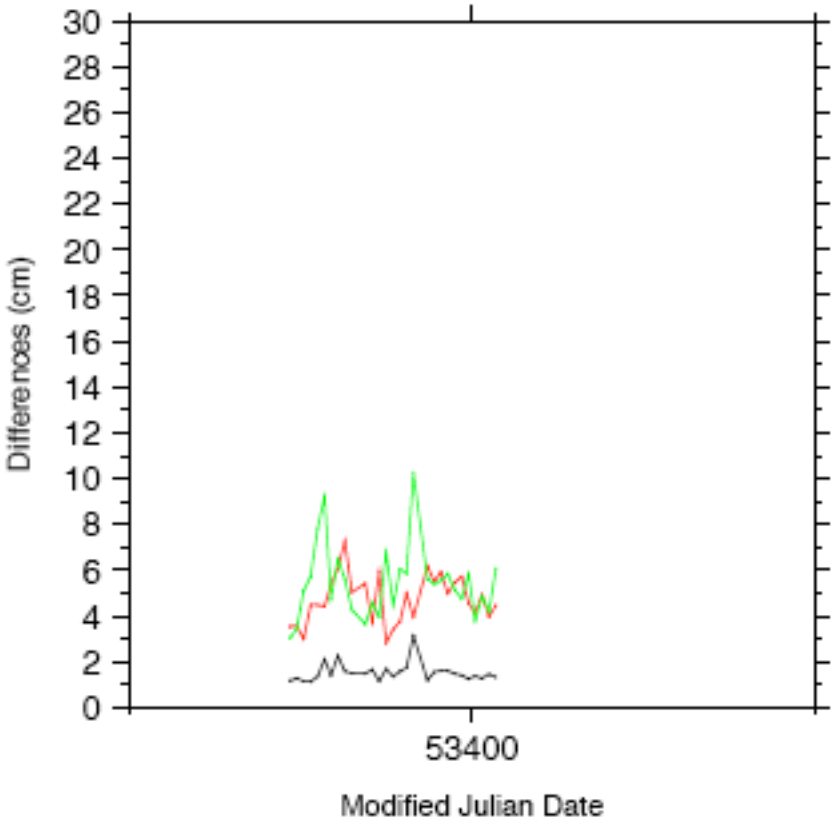
Radial Avg:

Along-Track AVG:

Cross-track AVG:

SPOT-5 Orbit Diffs: GOP vs GSFC-10dg

RMS

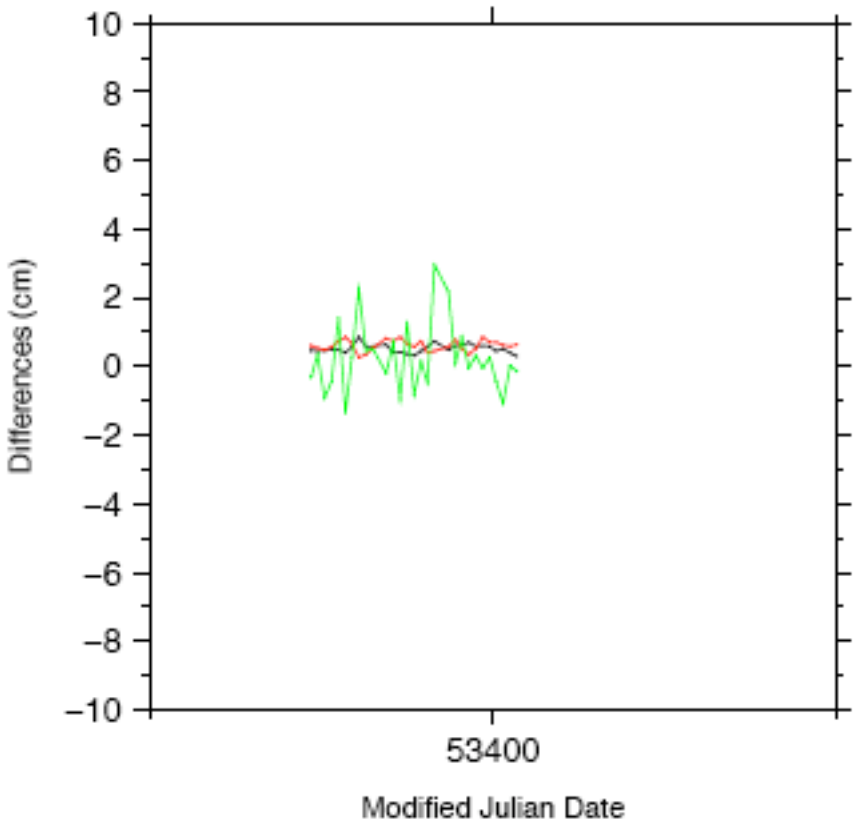


Radial RMS:

Along-Track RMS:

Cross-track RMS:

Average



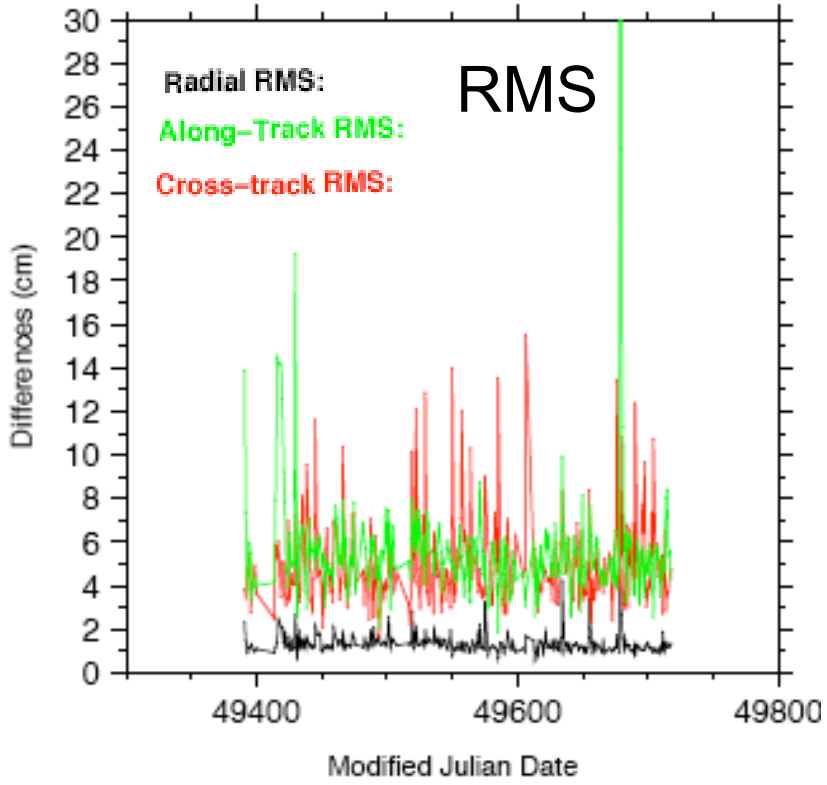
Radial Avg:

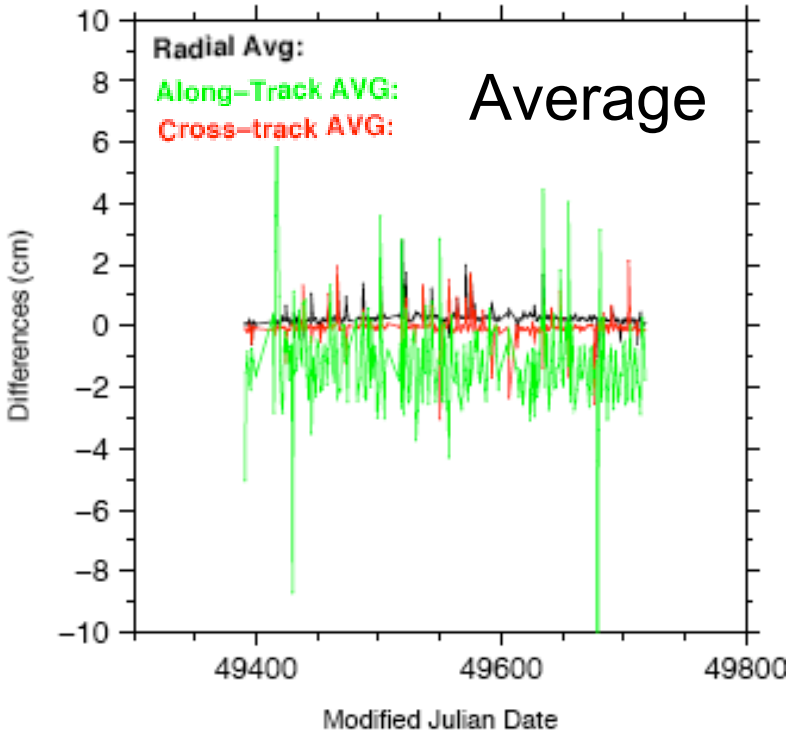
Along-Track AVG:

Cross-track AVG:

SPOT3: RMS Orbit Differences (1994-1996) (cm)

Series Compared	Radial	Cross-tr.	Along-tr.	N
IGN3 vs GSFC-10dg (1994)	1.32	4.93	5.46	274
IGN3 vs GSFC-10dg (1995)	1.27	5.39	5.43	321
IGN3 vs GSFC-10dg (1996)	1.19	5.58	5.17	290

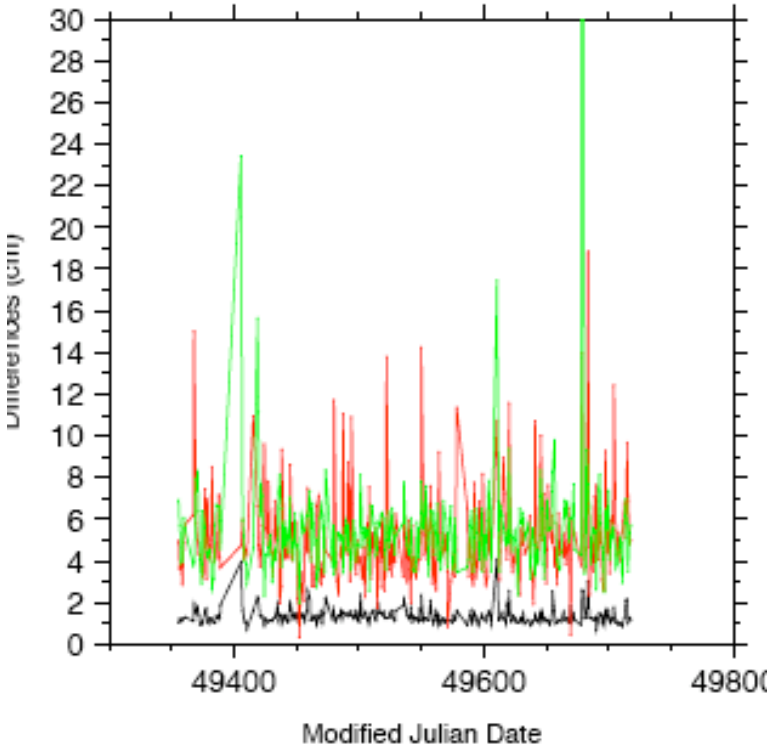




SPOT2: RMS Orbit Differences (1994) (cm)

Series Compared	Radial	Cross-tr.	Along-tr.	N
IGN3 vs GSFC-10dg (1994)	1.34	5.07	5.54	305

RMS

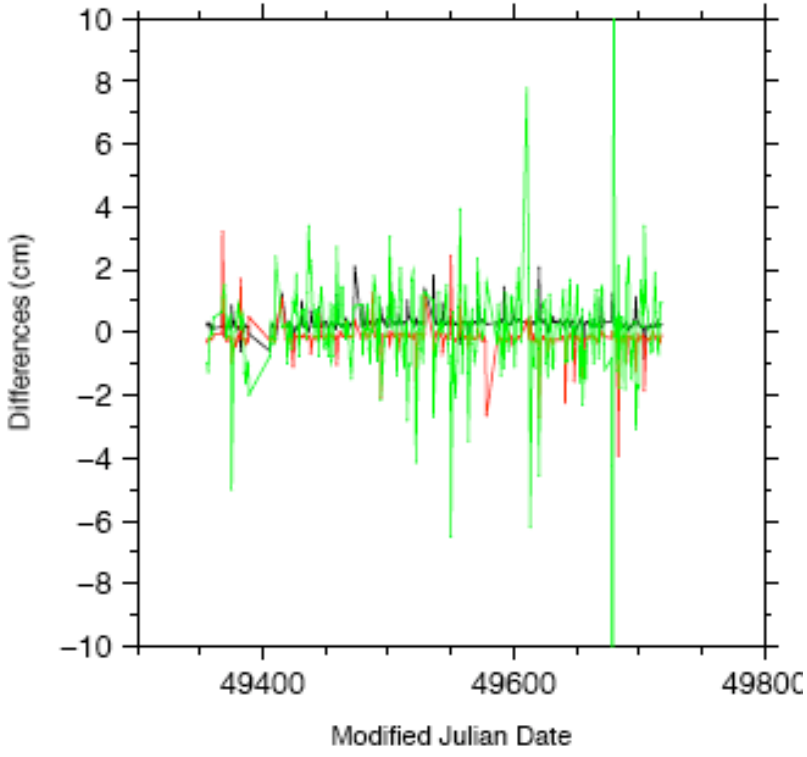


Radial RMS:

Along–Track RMS:

Cross–track RMS:

Average



Radial Avg:

Along–Track AVG:

Cross–track AVG:

Orbit Test Conclusions

1. **Analysis centers appear to be at the same level (Good overall radial agreement - 1.5 to 2.0 cm RMS in general). (Preliminary orbits - Not final submission orbits for all centers).**
2. **Some offsets appear in the mean differences (typically on the order of 1 cm) in the analysis differences between some centers in some components. Probably a minor issue at present.**
3. **Nothing in orbit comparisons to explain behaviour observed in DORIS SINEX combinations for some AC's:**
4. **Need to consider some other issues for some AC's; Troposphere Adjustment & COM offsets application; Method of Application of constraints for SINEX solutions (covariances).**

Handling of Offset Corrections by AC's

Calculate Offset Correction:

GSFC, AUS (GEODYN).

-> Requires validation of internal attitude model and correct measurement offsets & CoM. Fully validated for Jason & Topex (obviously) and probably for ENVISAT (since at 2003 TP/Jason SWT good SLR/DORIS ENVISAT orbit fits obtained).

For SPOT's? - Attitude model never validated with quaternion data.

==> **Might not necessarily solve problem - but will eliminate discrepancy with other centers.**

==> Can we obtain quaternion data for SP2, SP4, SP5 (even 1+ week of current data) for validation purposes in longer term?

Use Offset Correction on DORIS Data files:

IGN, INA, LCA, ESA, *GOP (?)*

Troposphere Modelling

Another Potential Source of Investigation:

ESA- GPT/Fix dry Saastoimonen + adjust wet (GMF)
(same as for IGS)
LCA- <2002; weather data a priori dry+wet (global bias/pass).
>2002; aprioiri ECMWF
IGN-

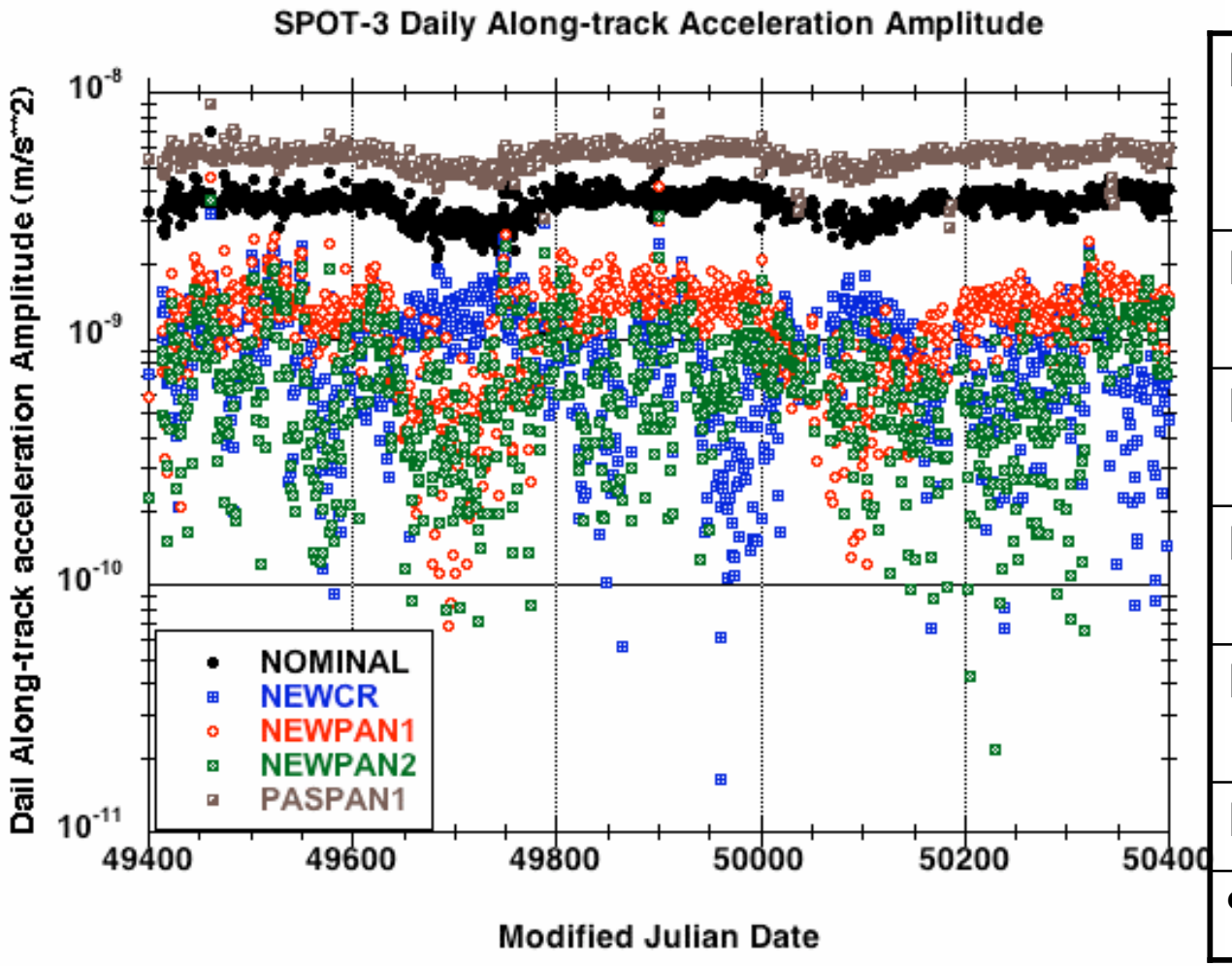
GEODYN-

SPOT-3 Macromodel Tests

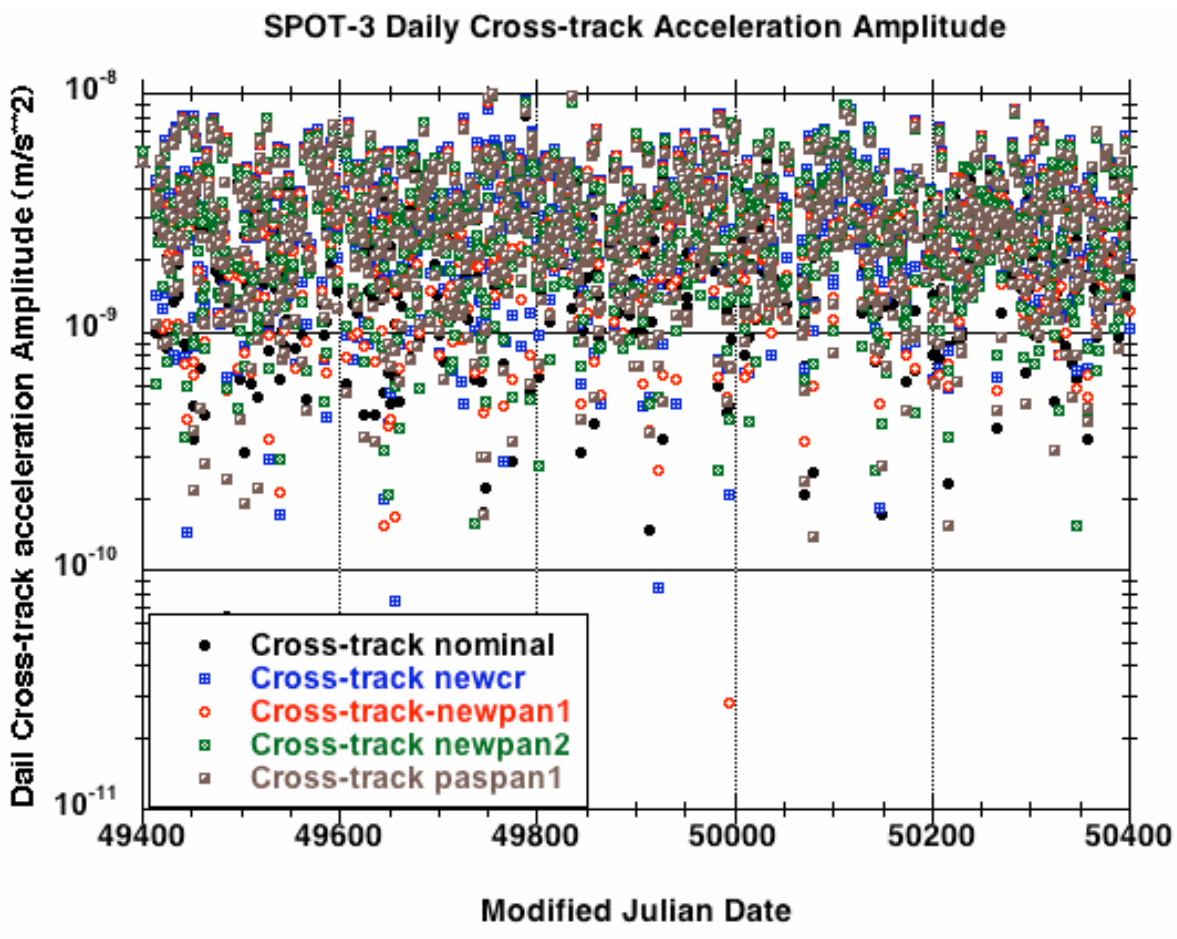
SPOT3: Macromodel Tests

Panel	**Area (m^2)**	**Nominal (σ, δ)**	**New Cr**	**NewPan1 (σ, δ)**	**NewPan2 (σ, δ)**	**PasPan1 (CNES-Model) (σ, δ)**
+X	6.69	0.54, 0.07	-	-	-	-
-X	6.69	0.54, 0.07	-	-	-	-
+Y	6.51	0.54, 0.064	-	-	-	0.54, 0.07
-Y	6.51	0.579, 0.09	-	-	0.767,0.09	0.54, 0.07
+Z	3.515	0.592, 0.091	-	-	-	0.54, 0.07
-Z	3.515	0.522, 0.028	-	-	-	0.54, 0.07
+SA	19.50	0.223, 0.120	-	0.277,0.12	0.273, 0.12	0.16, 0.16
-SA	19.50	0.319, 0.183	-	-	-	0.16, 0.16
Cr	-	1.0	**1.047**	1.0	1.0	1.0

-X (pitch + direction HRG instrument); -Y (roll); +Z (yaw axis & nadir)



Model	Mean, Median (10^{-9}m/s^2)¶
Nominal	3.94, 3.59
NewCr	1.39, 0.94
NewPan1	1.63, 1.26
NewPan2	1.37, 0.66
PasPan1	5.82, 5.61
¶ 961 samples.	



Model	Mean, Median (10^{-9} m/s^2)¶
Nominal	3.11, 2.76
NewCr	3.44, 3.14
NewPan1	3.29, 2.98
NewPan2	3.22, 2.89
PasPan1	3.06, 2.71
¶ 961 samples.	

TOPIC for Thursday IDS Round Table

IDS has a big challenge - so we need to focus on how we can make a delivery for ITRF2008. For round table (Thursday) we must decide what is feasible to contribute by mid-late January 2009 (first combination to Zuheir Altamimi); - Have second combination ready by early April.

fin

Preliminary GSFC test (Jan 2005)

Solution	T1	T2	T3	D	R1	R2	R3	Epoch
	mm	mm	mm	10-9	mas	mas	mas	y
xgsc05030	5.7	3.7	-70.7	4.66	2.674	-0.006	0.114	5: 33
	3.0	3.0	3.1	0.48	0.117	0.119	0.127	
datumsn	0.0	0.0	0.0	0.00	0.000	0.000	0.000	5: 30
	0.0	0.0	0.0	0.00	0.000	0.000	0.000	

Solution	N	WRMS-Pos.			Epoch	WRMS-Vel.			VF	MSF
		E	N	U		E	N	U		
		mm			y	mm/y				
xgsc05030	35	27.0	19.0	25.2	5: 33	0.0	0.0	0.0	0.02	1.00000
datumsnx.	35	0.0	0.0	0.0	5: 30	0.0	0.0	0.0	0.00	0.01000

Sigma_0 = 0.01774

Per week comparison to ITRF2005