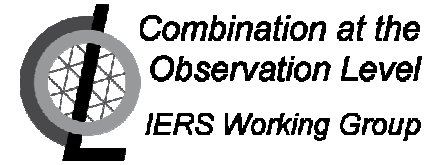




GRGS Analysis Centre report



Processing of 3 weeks of data (10-30 August 2008)

- 1. SLR (CNES-Observatoire de la Côte d'Azur)**
- 2. VLBI (Observatoire de Bordeaux)**
- 3. DORIS (CNES-CLS)**
- 4. GNSS (CNES-CLS)**

SLR processing

Arcs

LAGEOS/LAGEOS2 weekly arcs from 10/8 to 30/8/2008

Models

1	.champgtp.gin/data/potentiel/EIGEN-GRGS.RL02MF	gravite
1	.biancale.gin.data.marees.fes2004_80M2_50_K202_ell	marees
1	presatm/default	press.
1	marees_atm/ecmwf	m.atmospheriques
1	albedo/grilles_9.0/default	albedo
1	.geodexp.gin/data/pole/eop97c04_itrf2008g	pole
1	lunisolaires/de403bdlf.ad.ibm	planetes
1	.geodexp.gin/data/stations/stations_slr_apres_i08	stations
1	.geodexp.gin/data/stations/pbstat_v2	problemes (Appleby corrections)
1	charge/ocean/load_fes2004_itrf2005	loading

LAGEOS residuals

21409.50000	LASER:CC|	0.010852	0.009873	1877 mesures (	42 eliminees)	metre
21416.50000	LASER:CC|	0.015008	0.014054	1647 mesures (	39 eliminees)	metre
21423.50000	LASER:CC|	0.013952	0.011904	1871 mesures (	56 eliminees)	metre

LAGEOS2 residuals

21409.50000	LASER:CC|	0.010293	0.009461	1576 mesures (	4 eliminees)	metre
21416.50000	LASER:CC|	0.011178	0.010451	1572 mesures (	23 eliminees)	metre
21423.50000	LASER:CC|	0.009853	0.008943	1684 mesures (	14 eliminees)	metre

LAGEOS

mesures laser (format Quick Look)				satellite 7603901										aout 2008										pass.	obs.												
station	site	jour :		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
18248101	Lyg1 12356 S001 1824 KIEV			1	1					1				1	3							1	1						1						10	67	
18318501	Lyg1 12368 S001 1831 Lviv																												1	1					2	17	
18734901	Lyg1 12337 S003 1873 Simeiz			3	1		2	1		1	1	2	2	1		3	1	1	1	1	1	1	2	2	3	1	1	1	2	2	2	2	2		42	360	
18844401	Lyg1 12302 S002 1884 Riga								3					1		1				1															6	76	
18931801	Lyg1 12337 S006 1893 Katzively																												1	1	2	1	1	2	8	80	
D70802419	Lyg1 40442 M006 7080 Davis			1			2	1						1									1												6	55	
70900513	Lyg1 50107 M001 7090 Yarragadee			1		1	2	3	3	5	2	3	2	2	4	3	3	3	4	3	5	1			1	3	3	4	2	3	3	3	2	5	79	918	
71050725	Lyg1 40451 M105 7105 Washington			2			3	1	1	2	2					2					2	3	2	3	3			3		1				30	330		
71100412	Lyg1 40497 M001 7110 Monument_Pe																								1					1				2	23		
D71191401	Lyg1 40445 M004 7119 Haleakala			1	2			1		1						1	1	1	2	1	1	1	1	1		1	1		1	1	1			20	239		
D71240802	Lyg1 92201 M007 7124 Tahiti													1		1						1												3	39		
72371901	Lyg1 21611 S001 7237 Changchun			2	3	2	2	2	2	2	2	3				2		3	3			3	3			1	3	1	1	2			1	43	319		
D72496101	Lyg1 21601 S004 7249 Beijing				1																				2										3	16	
73085001	Lyg1 21704 S002 7308 Koganei									2																									2	13	
D73588901	Lyg1 21749 S001 7358 Tanegashima					1																													1	10	
D74031304	Lyg1 42202 M003 7403 Arequipa			1	1		1	2	1						2								1							1		1			11	65	
D74057902	Lts 41719 M001 7405 Concepcion						2	1		3	1				3					1															11	92	
74068801	Lyg1 41508 S003 7406 San_Juan			1	2		2	3	1	3	2	1	3	1	2		1	3	1	2	2	1	2	1	1	3	1	2	2	1	3	1	2	1	51	639	
75010602	Lyg1 30302 M003 7501 Hartebeesth							1			1				3	2	2	2	2		1		1	1	2			3	1	2				24	175		
D78106801	Lts 14001 S007 7810 Zimmerwald			2	1	3	3	1	4	2	2	5	4	3		3	2		3	2	3	3	1	3	3		4	2	4	5	4	4	2	78	1170		
D78113802	Lyg1 12205 S001 7811 Borowiec			1		1		1	1	2	1			1		1							1	1		2		1	2			2	1	19	208		
78212801	Lyg1 21605 S010 7821 Shanghai							2	1	1	2	2	1										1		1				1		1				13	126	
78244502	Lyg1 13402 S007 7824 San_Fernand			2	1			1	1	1			1	1	2	1	2		1	1	1		1		2	1	1	1	1	1	1	1		26	268		
D78259001	Lyg1 50119 S003 7825 Mount_Strom			2	2	5			2	1	3	2	2			3	3	1	5	4	3	3	2	2	3	5	1	2	2	3	3	3		4	71	642	
78325501	Lyg1 20101 S001 7832 Riyadh				2	1	1	2	2			2	2	2	1	1		1	2	2	2	2			2	2	1	1	2			2	1	36	308		
D78393402	Lyg1 11001 S002 7839 Graz			4		1	2	2	1	3	1	2	2	2	3	1	2		1	1	4	3	1	1	5		1	4	2	3	1	2		1	56	529	
78403501	Lyg1 13212 S001 7840 Herstmonceu			1	1		4	1	1	1			2		1	2	3	3		1					2	2	3	1			1		3	1	34	430	
78418701	Lyg1 14106 S011 7841 Potsdam			1				3	1	1	1	2		1		2	1				1	1	1												16	165	
79417701	Lyg1 12734 S008 7941 Matera			3	2	3	3	2	2	2	2	2	3	2	3	4	3	4	2	3	3	5	5	3	4	1	5	2	3	4	3	3	3	2	2	91	874
88341001	Lyg1 14201 S018 8834 Wettzell			3	1							3	2	2		1	1				1	3			2	1	2	2	1	4	2	1	4	1	37	271	
				total:	32	18	27	33	32	23	25	20	25	29	23	26	31	39	23	22																	
					21	29	29	22	26	29	32	27	35	21	30	27	27	28	20																	831	8524

LAGEOS2

mesures laser (format Quick Look)

satellite 9207002

aout 2008

		jour :		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	pass.	obs.																																											
station	site																																																																														
18248101	Lyg1 12356 S001 1824 KIEV																																1																																														
D70802419	Lyg1 40442 M006 7080 Davis																																2	1																																													
70900513	Lyg1 50107 M001 7090 Yarragadee																																1	2	1	3	3	4	3	3	1	4	3	4	2	4	3	3	5	3	3		2	2	4	3	4		2	2	3	3	3	83	1465														
71050725	Lyg1 40451 M105 7105 Washington																																1				1							1								1	1	1	1		1						1	9	91														
71100412	Lyg1 40497 M001 7110 Monument_Pe																																																																	1	10												
D71191401	Lyg1 40445 M004 7119 Haleakala																																1	1				2				1	1		1		2		3		2		1	2	1	1		3	1	3						26	323												
D71240802	Lyg1 92201 M007 7124 Tahiti																																													2						1														3	36												
72371901	Lyg1 21611 S001 7237 Changchun																																	1	1		1		1							1		1								1											7	39											
73085001	Lyg1 21704 S002 7308 Koganei																																												1	1	1																				3	18											
D73588901	Lyg1 21749 S001 7358 Tanegashima																																1	1	2																																												
D74031304	Lyg1 42202 M003 7403 Arequipa																																			1	3				1			1								2	1	1				2	1	1	1	1				16	135												
D74057902	Lts 41719 M001 7405 Concepcion																																			3		1	2				1								2															9	128												
74068801	Lyg1 41508 S003 7406 San_Juan																																3	2	2	2	3	2	4	2	4	2	3	3		4	2	4		4	2	4	2	3	2	4	2	4	2	4	2	2	3			82	1124												
75010602	Lyg1 30302 M003 7501 Hartebeesth																																									3	1	2	1	1	1					1	1	1		1	1	2								16	97												
D78106801	Lts 14001 S007 7810 Zimmerwald																																	1	4		2	3		2	4	4	1		3	1		4	1	4	3		3	1		3	2	4	4	4	4	1				63	921												
78212801	Lyg1 21605 S010 7821 Shanghai																																									1																																					
78244502	Lyg1 13402 S007 7824 San_Fernand																																										1		1																																		
D78259001	Lyg1 50119 S003 7825 Mount_Strom																																2	3	2		2	3			3	2			3	3	2	4	3	2	2	4	1	4	3		4	3	3	3	3		3			67	966												
78325501	Lyg1 20101 S001 7832 Riyadh																																			1	1	1	1		1		1						1	1		1				1		1							1	13	102												
D78393402	Lyg1 11001 S002 7839 Graz																																1			1	3	1	2		1	1	3	2		3		1		4	3				2		2	2	2	1	1				36	400													
78403501	Lyg1 13212 S001 7840 Herstmonceu																																3	1		2			2		1		2		1	3			1				1		2							2	1			22	252												
78418701	Lyg1 14106 S011 7841 Potsdam																																													1																																	
79417701	Lyg1 12734 S008 7941 Matera																																1	1	1	1	3	1	1	1		2	3	1	2	4	2	4	2	4	2	4	2	4	2	3	2	3	1	2	1	2	1	2			61	653											
88341001	Lyg1 14201 S018 8834 Wettzell																																1	1					1			1		2	2				1	2		1	3		1	1	2	4			3	3			29	223													
total:		18	14	25	15	16	17	17	17	17	17	17	16	17	23	20	17	19	17	19	23	16	17															561	7076																																								
		15	11	17	10	17	18	29	22	25	15	19	16	23	20	14																																																															

Internal parameters (7-day Lageos arc from 10/08/2008)

orbite	1	0.454885437005077E+07	+/-	0.000000000000000E+00	1	[EX INST 2008081000 LAG1]
orbite	2	-0.106343086536461E+08	+/-	0.000000000000000E+00	1	[EY INST 2008081000 LAG1]
orbite	3	0.411989137271572E+07	+/-	0.000000000000000E+00	1	[EZ INST 2008081000 LAG1]
orbite	4	-0.119818307789841E+04	+/-	0.000000000000000E+00	1	[EXP INST 2008081000 LAG1]
orbite	5	-0.242916495785588E+04	+/-	0.000000000000000E+00	1	[EYP INST 2008081000 LAG1]
orbite	6	-0.501152141995431E+04	+/-	0.000000000000000E+00	1	[EZP INST 2008081000 LAG1]
pression	7	0.999997632651766E+00	+/-	0.000000000000000E+00	1	[FS 2008081312 LAG1]
tbias	8	-0.347331931950040E-11	+/-	0.000000000000000E+00	1	[BT 2008081000 LAG1]
xbias	9	0.173660241693058E-10	+/-	0.000000000000000E+00	1	[BX 2008081000 LAG1]
ybias	10	0.183626010330153E-11	+/-	0.000000000000000E+00	1	[BY 2008081000 LAG1]

mesures	152	0.204833720279796E-01	+/-	0.000000000000000E+00	1	[MRB 1873490108081600LAG1]
mesures	153	-0.366210987762446E-01	+/-	0.000000000000000E+00	1	[MRB 1884440108081600LAG1]
mesures	154	0.604639180361218E-02	+/-	0.000000000000000E+00	1	[MRB 7080241908081600LAG1]
mesures	155	0.635233950238776E-02	+/-	0.000000000000000E+00	1	[MRB 7090051308081600LAG1]
mesures	156	-0.600672894692196E-02	+/-	0.000000000000000E+00	1	[MRB 7105072508081600LAG1]
mesures	157	0.553473590961904E-02	+/-	0.000000000000000E+00	1	[MRB 7119140108081600LAG1]
mesures	158	0.381253388679629E-02	+/-	0.000000000000000E+00	1	[MRB 7124080208081600LAG1]
mesures	159	-0.378602547838642E-02	+/-	0.000000000000000E+00	1	[MRB 7237190108081600LAG1]
mesures	160	0.873130862938725E-03	+/-	0.000000000000000E+00	1	[MRB 7403130408081600LAG1]
mesures	161	0.816967841411715E-03	+/-	0.000000000000000E+00	1	[MRB 7405790208081600LAG1]
mesures	162	-0.707410315742555E-02	+/-	0.000000000000000E+00	1	[MRB 7406880108081600LAG1]
mesures	163	-0.102138179682537E-01	+/-	0.000000000000000E+00	1	[MRB 7501060208081600LAG1]
mesures	164	-0.609998069869435E-02	+/-	0.000000000000000E+00	1	[MRB 7810680108081600LAG1]
mesures	165	0.786705055625890E-02	+/-	0.000000000000000E+00	1	[MRB 7811380208081600LAG1]
mesures	166	-0.241871466325746E-01	+/-	0.000000000000000E+00	1	[MRB 7821280108081600LAG1]
mesures	167	-0.240730467226832E-01	+/-	0.000000000000000E+00	1	[MRB 7824450208081600LAG1]
mesures	168	0.302308303287382E-02	+/-	0.000000000000000E+00	1	[MRB 7825900108081600LAG1]
mesures	169	-0.860680070331924E-02	+/-	0.000000000000000E+00	1	[MRB 7832550108081600LAG1]
mesures	170	-0.475101997155948E-02	+/-	0.000000000000000E+00	1	[MRB 7839340208081600LAG1]
mesures	171	-0.453845943577896E-02	+/-	0.000000000000000E+00	1	[MRB 7840350108081600LAG1]
mesures	172	-0.123422716586547E-01	+/-	0.000000000000000E+00	1	[MRB 7841870108081600LAG1]
mesures	173	-0.482305653707644E-02	+/-	0.000000000000000E+00	1	[MRB 7941770108081600LAG1]
mesures	174	0.620275572182679E-03	+/-	0.000000000000000E+00	1	[MRB 8834100108081600LAG1]

External parameters (7-day Lageos arc from 10/08/2008)

pole-x	11	0.141304765123548E-05	+/-	0.000000000000000E+00	1	[PX	2008080900]
pole-x	12	0.141533597181031E-05	+/-	0.000000000000000E+00	1	[PX	2008081000]
...								
pole-x	18	0.142364083016772E-05	+/-	0.000000000000000E+00	1	[PX	2008081600]
pole-x	19	0.142645274951815E-05	+/-	0.000000000000000E+00	1	[PX	2008081700]
pole-y	20	0.190333003066793E-05	+/-	0.000000000000000E+00	1	[PY	2008080900]
pole-y	21	0.188837837674251E-05	+/-	0.000000000000000E+00	1	[PY	2008081000]
...								
pole-y	27	0.179663708386615E-05	+/-	0.000000000000000E+00	1	[PY	2008081600]
pole-y	28	0.178426948686105E-05	+/-	0.000000000000000E+00	1	[PY	2008081700]
pole-t	29	-0.334572240000000E+02	+/-	0.000000000000000E+00	1	[PTI	2008080900	LAG1]
pole-t	30	-0.334572520000000E+02	+/-	0.000000000000000E+00	1	[PT	2008081000	LAG1]
...								
pole-t	36	-0.334568160000000E+02	+/-	0.000000000000000E+00	1	[PT	2008081600	LAG1]
pole-t	37	-0.334571430000000E+02	+/-	0.000000000000000E+00	1	[PTF	2008081700	LAG1]
nutat-eps	38	-0.373888310871674E-07	+/-	0.000000000000000E+00	1	[NE	2008081000]
nutat-eps	39	-0.371682408622626E-07	+/-	0.000000000000000E+00	1	[NE	2008081012]
...								
nutat-eps	51	-0.369331062269245E-07	+/-	0.000000000000000E+00	1	[NE	2008081612]
nutat-eps	52	-0.367537251649139E-07	+/-	0.000000000000000E+00	1	[NE	2008081700]
nutat-psi	53	-0.336552809289429E-06	+/-	0.000000000000000E+00	1	[NP	2008081000]
nutat-psi	54	-0.335689840937054E-06	+/-	0.000000000000000E+00	1	[NP	2008081012]
...								
nutat-psi	66	-0.334070563242148E-06	+/-	0.000000000000000E+00	1	[NP	2008081612]
nutat-psi	67	-0.334172374115181E-06	+/-	0.000000000000000E+00	1	[NP	2008081700]
stations	68	0.419442631843162E+07	+/-	0.000000000000000E+00	1	[SX	1312000011001S002088]	
stations	69	0.116269424107598E+07	+/-	0.000000000000000E+00	1	[SY	1312000011001S002088]	
stations	70	0.464724677049172E+07	+/-	0.000000000000000E+00	1	[SZ	1312000011001S002088]	
...								
stations	134	-0.524640724692854E+07	+/-	0.000000000000000E+00	1	[SX	1312000092201M007088]	
stations	135	-0.307728438461807E+07	+/-	0.000000000000000E+00	1	[SY	1312000092201M007088]	
stations	136	-0.191381380352485E+07	+/-	0.000000000000000E+00	1	[SZ	1312000092201M007088]	

VLBI processing

Laboratoire d'Astrophysique de Bordeaux, France

G. Bourda & A. Bellanger

CONT08 campaign analysis synthesis

- **Constraints Troposphere:** $dZ_{t+\Delta t} - dZ_t = 0 \pm 10 \text{ cm}$ $\Delta t = 1 \text{ h}$
- **Constraints Clocks:** $dC_{t+\Delta t} - dC_t = 0 \pm 10 \mu\text{s}$ $\Delta t = 1 \text{ h}$

	Week 1	Week 2	Week 3
# measures used (# measures removed)	44 569 (2 660)	63 172 (2 162)	26 153 (2 099)
# quasars	78	80	80
# stations	11	11	11
Mean weighted residuals	1.1 cm	1.1 cm	1.6 cm

Stations: Nyalesund, Westford, Svetloe, Wettzell, Onsala, Tsukuba, Medicina, Zelenchukskaya, Hartrao, Kokee, Tigoconc.

DORIS processing

Statistics (mean values per arc)

JASON2: 6 arcs

DORIS wrms 0.319 mm/s validated data 59523 edited 22077

SLR wrms 1.53 cm validated data 1133 edited 67

Envisat: 7 arcs

DORIS wrms 0.364 mm/s validated data 26738 edited 6673

SLR wrms 1.04 cm validated data 1017 edited 44

SPOT2: 6 arcs

DORIS wrms 0.381 mm/s validated data 11105 edited 1307

SPOT4: 7 arcs

DORIS wrms 0.387 mm/s validated data 15546 edited 525

SPOT5: 6 arcs

DORIS wrms 0.353 mm/s validated data 33419 edited 2584

DORIS normal equations

grg08223dw01.n2

grg08230dw01.n2

grg08237dw01.n2

Normal equation content:

-Station coordinates for all stations: weekly parameters, epoch Wednesday 12:00

-X-pole, Y-pole, UT1-UTC: daily parameters at 00:00

-Nutation: at 00:00 and 12:00

-X,Y,Z components of the vector « satellite center of mass – DORIS antenna phase center »

-Tropospheric zenithal bias per pass for the stations: Hartebeesthoek, Greenbelt, Mont Stromlo, Papeete, Kokee Park, Ny-Alesund

Models:

Gravity field : EIGEN-GRGS.RL02MF

Reference system: ITRF2008 (DPOD2008 for stations, EOP08C04 for EOP)

Mean pole: IERS conventions 2010

Troposphere : GMF + GPT

Ocean tides: FES2004

Tuned macro-model « Stab5 » from GRGS (JM Lemoine) for Jason-2

GNSS processing changes

IERS Conventions (2010) :

- Mean pole model
- Oceanic pole tide (Desai up to degree 12)

Others changes :

- Use of PCO's from igs08.atx (instead of IGS05.atx before)
- Inclusion of tropospheric gradients
(see impact on displacements below)
- Tropospheric zenital biases and gradients let un-reduced in the NEQ for the following collocated sites : hrao conz usn3 gode str1 thti kokb nya1 nyal

Two solution including previous changes have been delivered :

Solution n6 (October 2011) : contains errors in EOP parametrization and should be not used !

Solution n7 (November 2011) : The errors are (hopefully) corrected.

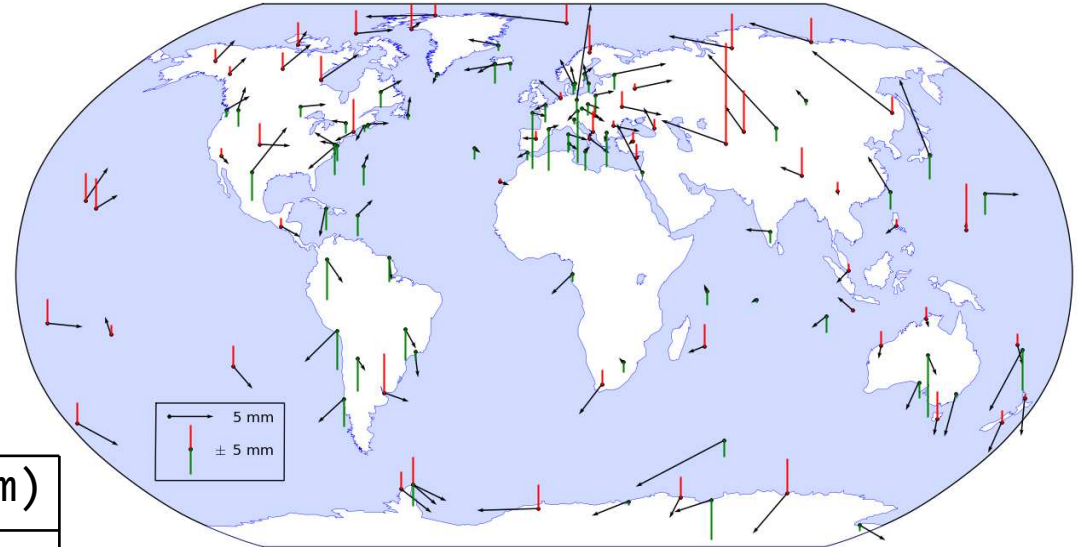
Residuals (~8 mm for undifferenced phase)

Comming next :

- GNSS PCV in NEQ
- Glonass
- Possibility to deliver diurnal NEQ (instead of weekly today)
- Attitude law during eclipses seasons (Jan Kouba modelling)

Introduction of tropospheric gradients

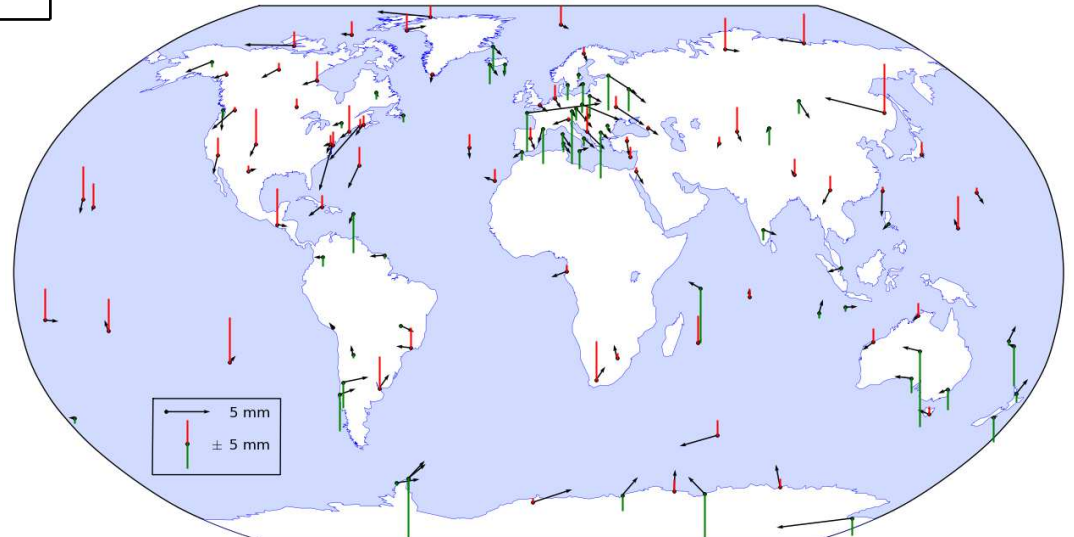
Without →



Gradients	E(mm)	N(mm)	Up(mm)
without	2.7	3.8	6.8
with	1.2	1.4	4.4

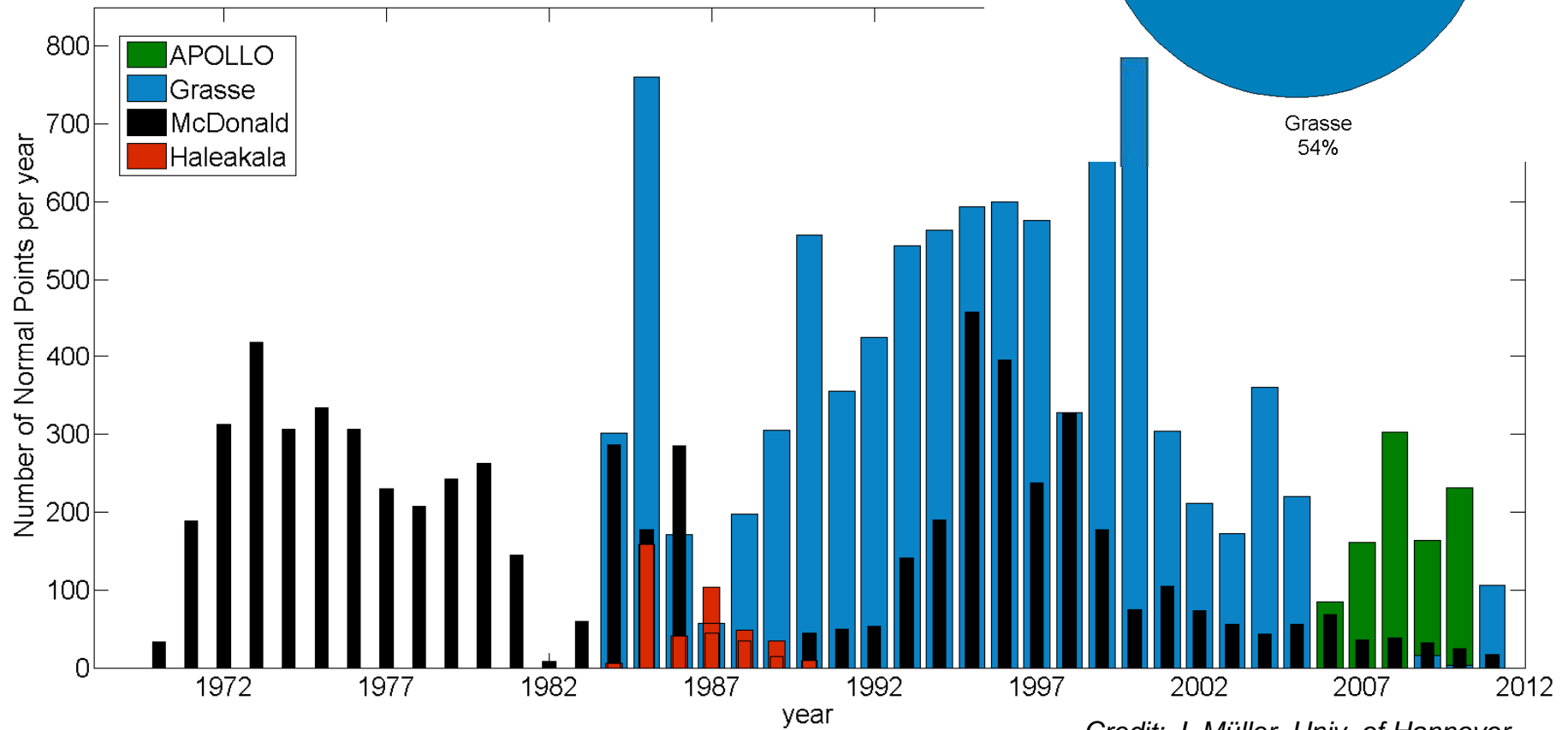
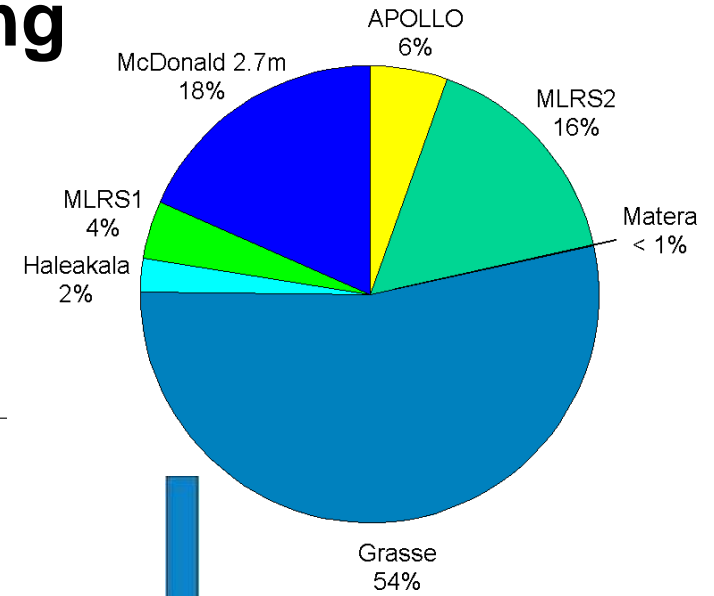
Global RMS of Helmert residuals between GRG and IGS combined solution with or without tropospheric gradients (from P. Rebischung)

With →



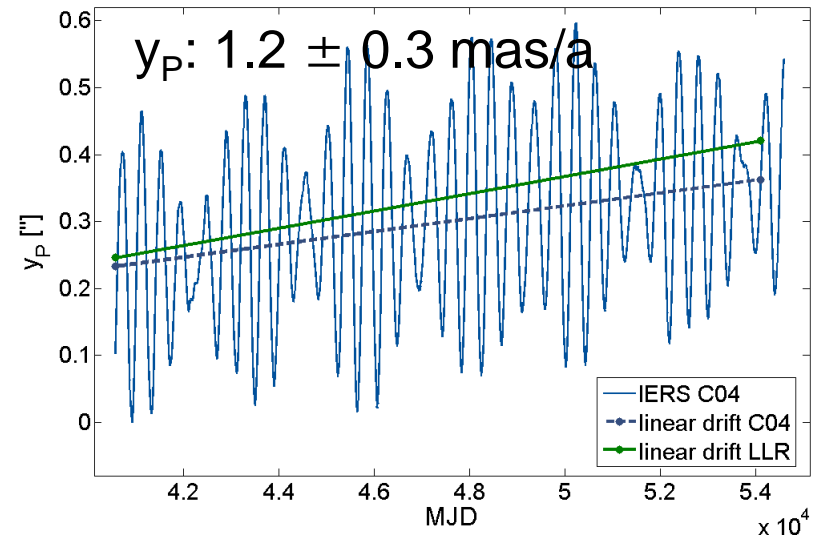
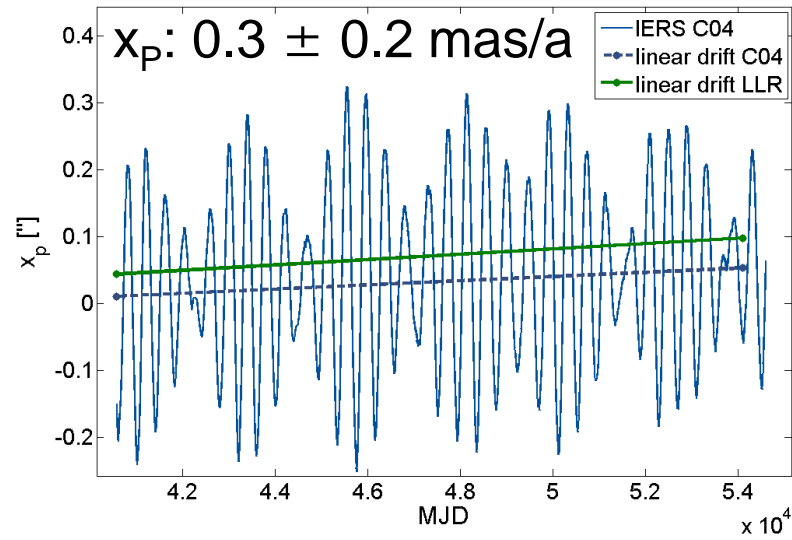
LLR processing

1970 - 2011: ca.17,000 normal points

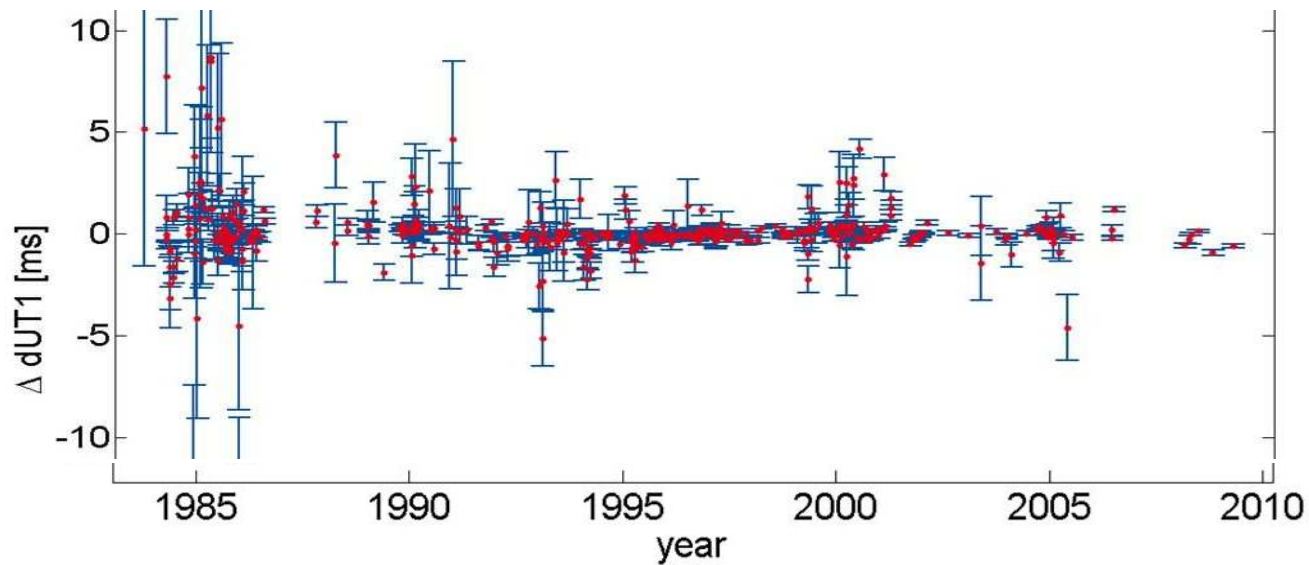


Credit: J. Müller, Univ. of Hannover

Differences between polar motion linear drift from IERS C04 and LLR for time span 1970-2008



Determination of UT1-UTC in global LLR adjustment



Credit: J. Müller, Univ. of Hannover

Open items (from Juergen Mueller)

- Added-value for long-term EOP monitoring by LLR?
- Celestial reference frame: better alignment of dynamic and ICRS equator possible/required?
- Change of time scale in planetary/lunar ephemeris ($T_{\text{eph}} - \text{TCB}$)?

Future steps

- Enhanced studies on ephemeris, earth rotation and relativity
- Software update to include and process novel observations from lunar transponders and orbiters (and VLBI in a more direct way)