

COL WORKING GROUP

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- (2) Observatoire de Paris / GRGS, Paris, France
- (3) DGF, Munich, Germany
- (4) CNES / CLS, Ramonville Saint Agne, France
- (5) AIUB, Bern, Switzerland
- (6) ESOC, Darmstadt, Germany
- (7) GFZ, Postdam, Germany
- (8) TU Vienna, Austria
- (9) IGN-LAREG / GRGS, France
- (10) IMCCE/GRGS Paris

For boosting and improving the COL, a dedicated Working Group was set up in 2009

■ 7 Analysis Centres

■ 2 Combination Centres: DGFI / GRGS

COL-WG participants and software packages

Analysis Centres	Techniques	Software
AIUB/BKG DGFI	SLR, GNSS VLBI SLR	Bernese 5.1 DOGS 5.0 OCCAM 6.1 LSM
ESOC GFZ GRGS ASI	SLR+GNSS, +DORIS SLR+GNSS SLR,GNSS,VLBI,DORIS SLR	NAPEOS EPOSOC 06.61 GINS/DYNAMO GEODYN/SOLVE
TUW GSFC OPA	VLBI SLR,GNSS, DORIS VLBI	VieVS GEODYN/SOLVE CALC-SOLVE
Combination Centres		
DGFI GRGS		DOGS-CS DYNAMO

Table 1: participants, techniques & software

STRATEGY FOR NEQs PRODUCTION

- Selected DORIS, GPS, SLR and VLBI stations (Fig.1-4)
- Use COMMON models (Tab. 2) and a-priori values in the various software processing geodetic data (Tab. 1)
- Adopt the same parametrization for the NEQs (Tab. 3)

Gravity Field	EIGEN model computed from GRACE-GOCE completed by the mean gravity variations of the atmosphere and the non-IB oceanic response
Ocean Tides Loading	FES2004 check at the triple co-location sites
Troposphere Delay	GPT+GMF for radio-electrical waves, Mendes-Pavlis for optical waves
Atmospheric Tide Model	Ray-Ponte (2003)
Atmospheric Loading	Not applied

Table 2: MODELS

Parameters	Implementation into SINEX files	Initial values
Pole, UT1-UTC or UT1-TAI	XPO, YPO, UT : Offset + Drift at 12h or PWL at 0h	IERS EOP 08-C04
Pole Rate	XPOR, YPOR 1pt/day at 12h	Set to 0
LOD	LOD 1pt/day at 12h	IERS EOP 08-C04
Nutation angles	NUT_X, NUT_Y corrections to the model IAU2000	IERS EOP 08-C04
Station coordinates	SX, SY, SZ at mid epoch	ITRF2008
Radio sources coordinates	RS_RA, RS_DE 1pt/week	ICRF2
Zenithal Trop. Delay Wet comp. (TROWET) and horiz. gradients (TGETOT,TGNTOT) limited to 7 stations	TROWET: Adjustment of the wet component to the model Every 2-hours or Every 1 hour: TGETOT, TGNTOT daily 00h	GPT/GMF model for radio waves & Mendes/Pavlis for optical waves

Table 3: PARAMETRIZATION

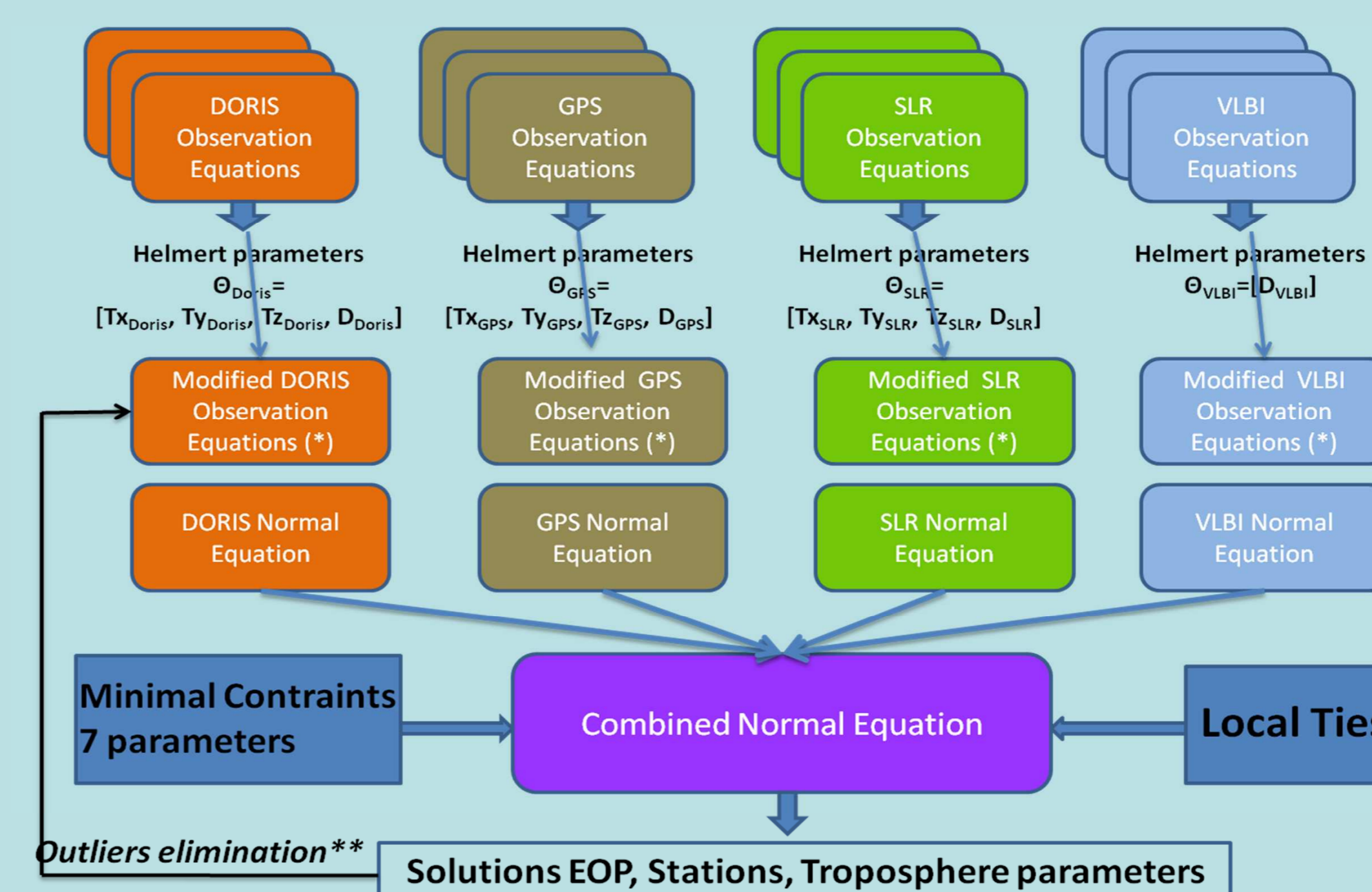
REFERENCES

- DISCUSSION FORUM : <http://grgs.obspm.fr/forum/>.
- DATA ON FTP (NEQs and solutions) : <ftp://hpiers.obspm.fr/iers/eop/grgs/>
- WEB SITE dedicated to COL: <http://hpiers.obspm.fr/col/>

INTER-COMPARISON BY COMBINATION CENTERS

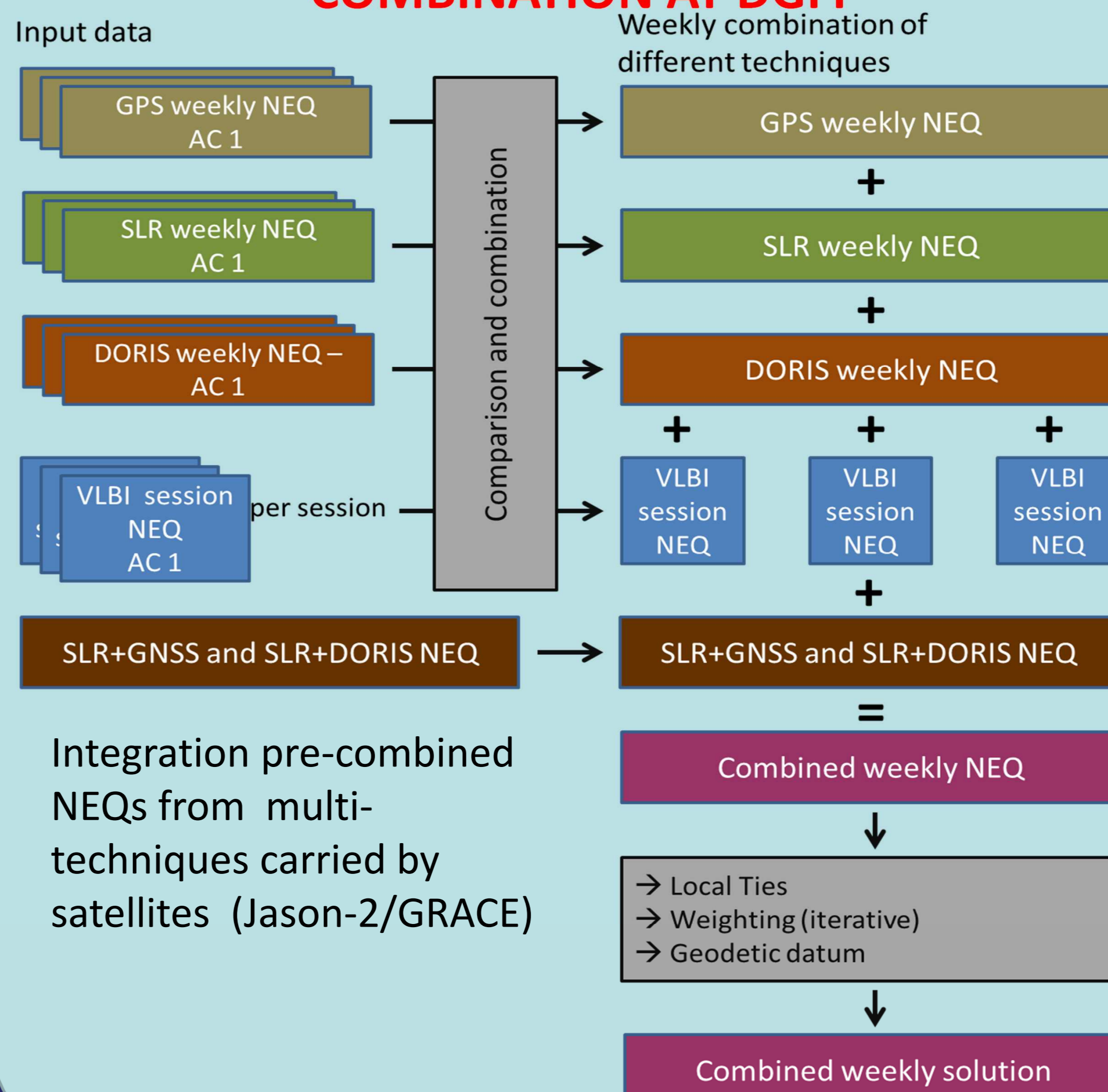
- Benchmark from August 10 to August 30, 2008 including observations of the intensive CONT08 VLBI campaign
- It permitted to unveil inconsistencies → the Analysis Centres **homogenized** their software by adopting 1) same set of parameters 2) common models and a-priori values for geodetic parameters

COMBINATION AT GRGS



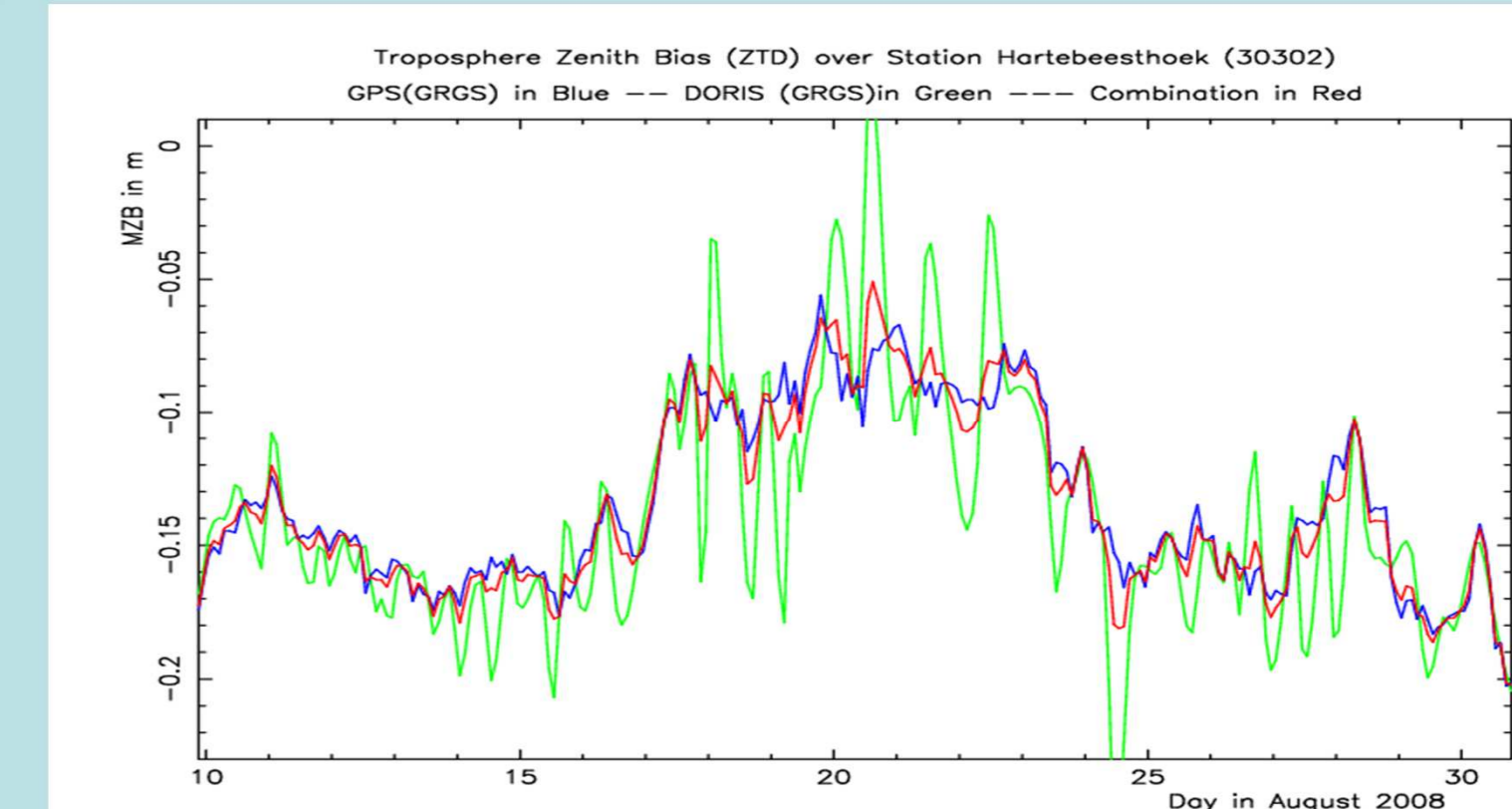
(**) major difference between combination at NEQ level and at Observation level
Measurements of one technique allow detection of outliers of another technique at observation level

COMBINATION AT DGFI



Integration pre-combined NEQs from multi-techniques carried by satellites (Jason-2/GRACE)

SCIENTIFIC EXPLOITATION



Zenithal Tropospheric Delay corrections versus model over collocated DORIS and GPS station (Hartebeesthoek).

A unknown period of 10 days appears in the ZTD corrections. Mutual troposphere parameters on collocation sites bring more information on collocation site.

Further investigations

- Hourly estimation: pole coordinates & UT, Troposphere delay)
- Low degree spherical harmonic coefficients of gravity field
- Combination at observation equations level
- Integration of spatial ties (Jason-2, GRACE, GRASP).

WHAT IS THE MULTI-TECHNIQUE COMBINATION AT OBSERVATION LEVEL?

Main objective of Combination at Observation Level (COL) is to estimate CONSISTENTLY geodetic parameters (EOP, station coordinates, tropospheric delay, quasars coordinates,...) from all existent space geodesy observations. Present combination is done at the level of the Normal Equations (NEQs).

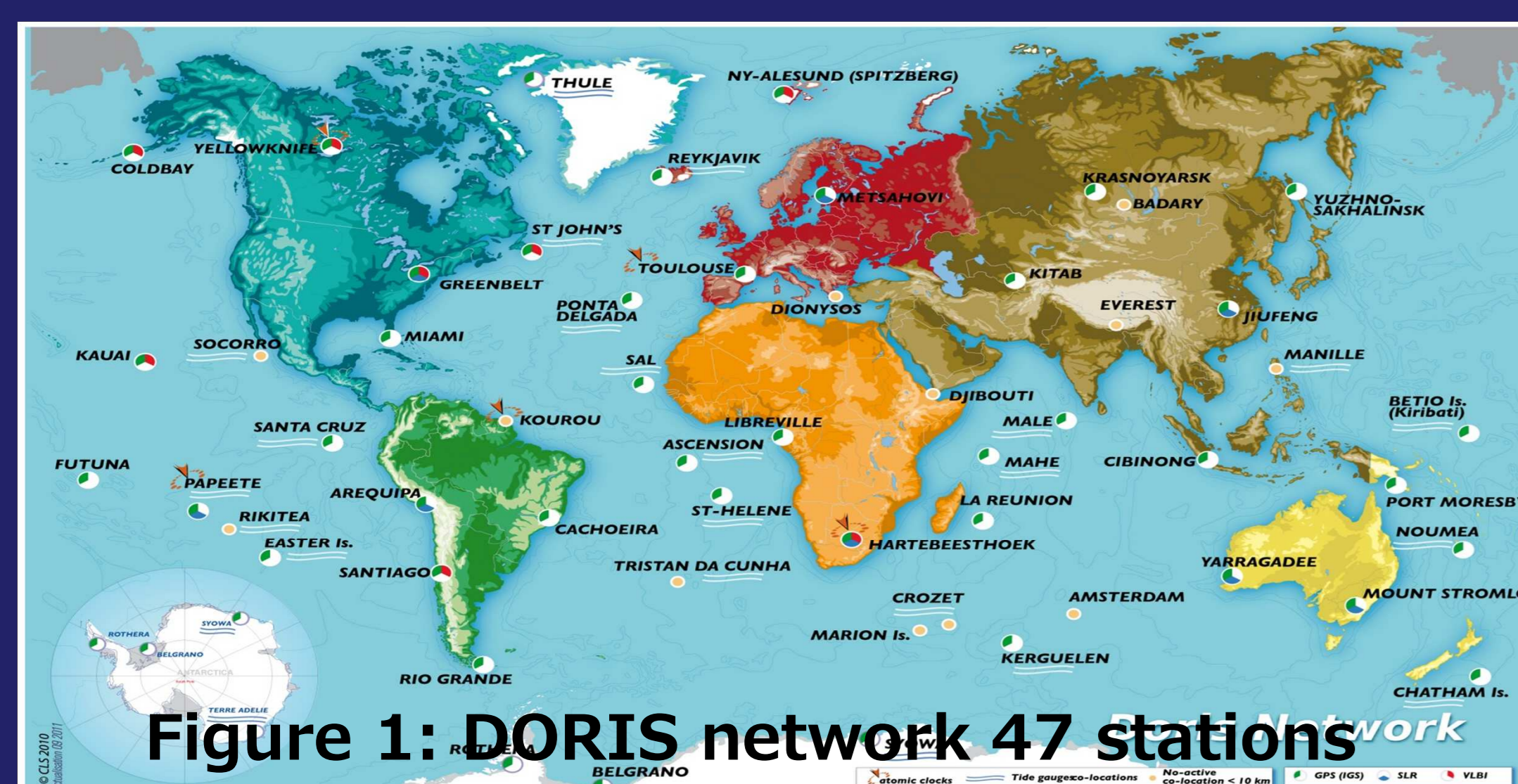


Figure 1: DORIS network 47 stations



Figure 2: GPS network 144 stations

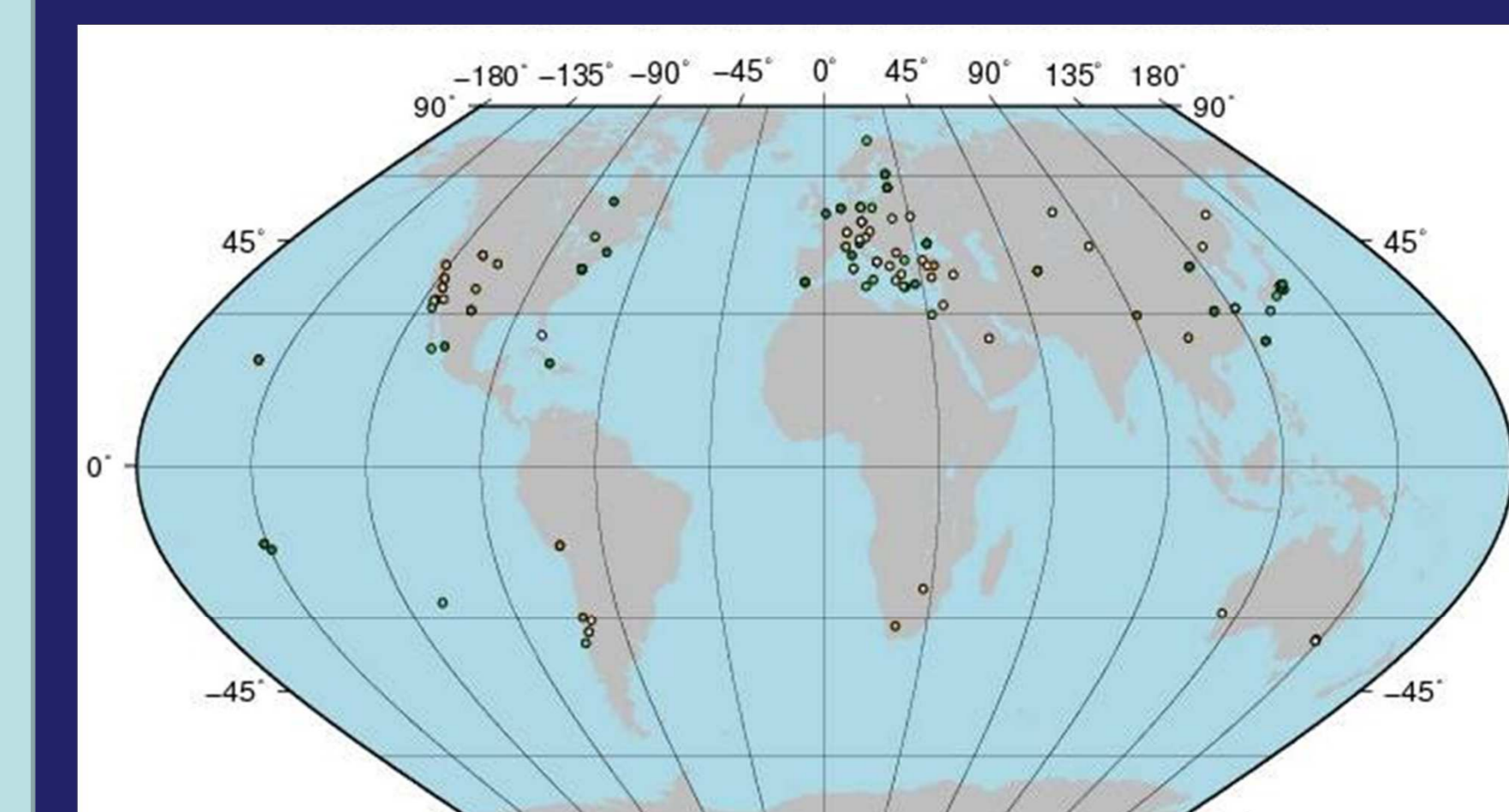


Figure 3: SLR network 28 stations

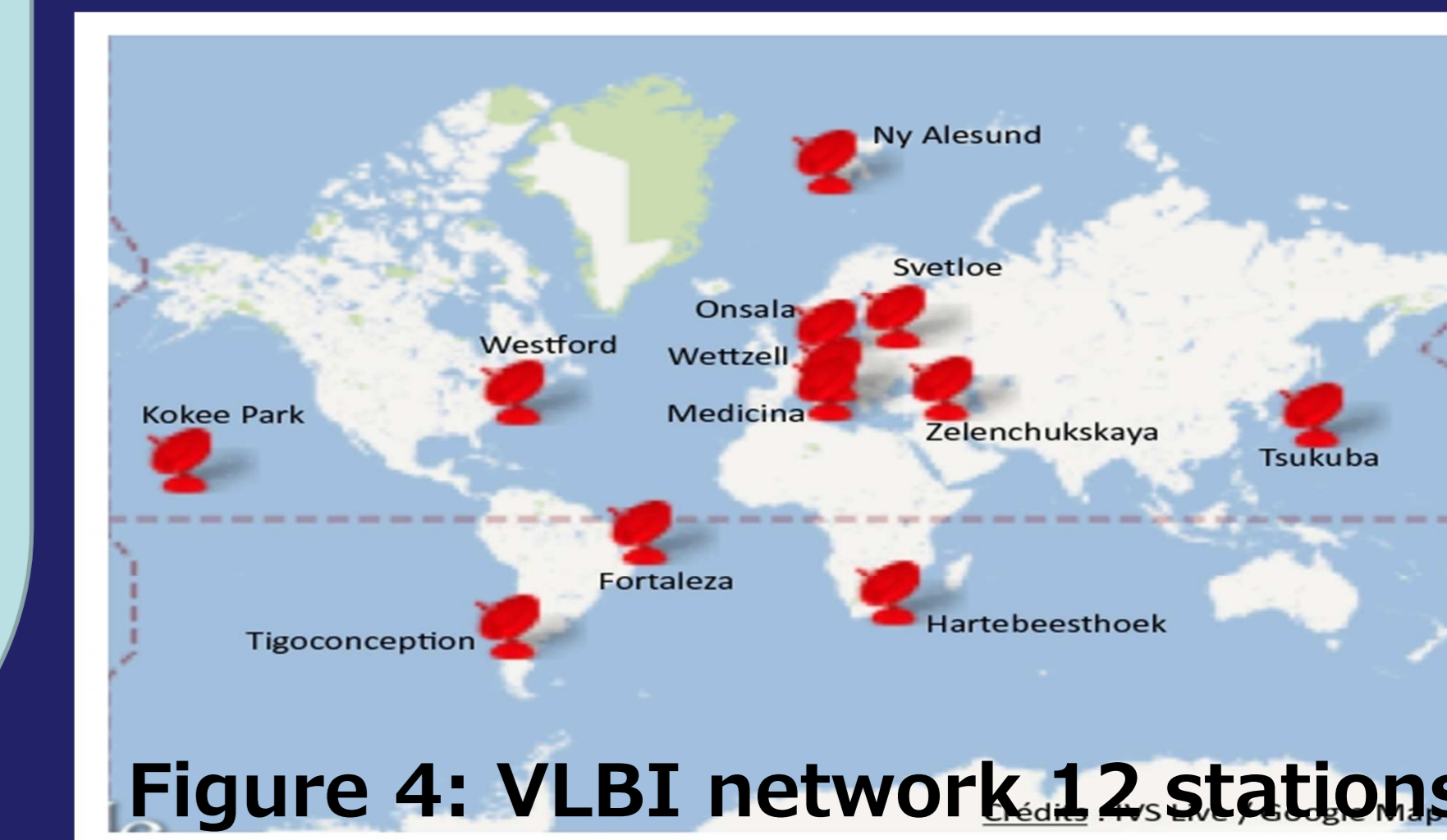


Figure 4: VLBI network 12 stations