

## Reviewing the approach of the various groups: Models, standards & parametrisation.

We looked at the « COL\_analysis\_summary\_XXXX.xls » provided by all the 5 groups ( AIUB&BKG, DGFI, ESA/ESOC, GFZ, GRGS)

(Compiled version of all xls files)

The **agreements** & **differences** in the models and parametrisation concern:

- Reference system and stations displacements
- Gravity forces modelling
- Non-gravity forces modelling
- Measurements specificities
- Parameters modelisation

# Reference system & stations displacements

## Common to all groups :

- polar motion, nutation and UT1 : IERS conventions
- quasar coordinates : ICRF2
- Earth tides, pole tides : follow IERS2003 conventions  
(mean pole values used may differ.... )

## Differences :

- **A priori stations coordinates and velocities** : ITRF2000, ITRF2005, VTRF2000 or derived versions.
- **Ocean loading** : not applied , fes2004 w&wo admittance or GOT00b
- **Atmospheric loading** : not applied, ECMWF derived 3D pressure fields or Petrov&Boy 2004.

## Station displacements differences

	VLBI	DORIS	LASER	GNSS
AIUB/BKG	-	-	OL: FES2004	OL: FES2004
DGFI	AL : Petrov&Boy 2004 OL: FES2004	-	OL: GOT00b	-
ESA/ESOC	-	OL: FES2004 + CMC values	OL: FES2004 + CMC values	OL: FES2004 + CMC values
GFZ	-	-	OL: not applied	OL: not applied
GRGS	AL : ECMWF OL: FES2004 + adm.	AL : ECMWF OL: FES2004 + adm.	OL: FES2004 + adm.	OL: FES2004 + adm.

AL: Atmospheric loading  
OL: Oceanic loading

# Gravity field modelling

## Common to all groups :

- Third bodies : de405 / de421
- Earth and pole tides : IERS2003 conventions (tide2000?)

## Differences :

- **Static gravity field** : JGM3, EIGEN-GL05C, EIGEN-GL04S , EIGEN-GL04C, GGM02S with different max degree (12 to 120 depending on satellites missions)
- **Variable gravity field** : not applied or various versions derived from Grace models (up to degree 12x12) , GFZ use the dealiasing products A0D1B
- **ocean tides** : CSR3.0 , CSR4.0, FES2004, GOT.00b
- **Atmospheric tides and gravity** : not applied, ECMWF or NCEP derived models

## Surfaces forces & empirical modeling

**Non gravitational forces & Adjusted Empirical parameters (type and number per day)** differs depending on the Analysis Center and the satellites.

**Atmospheric density** : not applied, DTM94 or MSIS-90

**Earth radiation (albedo/IR)** : not applied, Knocke&Ries, ECMWF grids, empirical models.

The associated parameters do not appears in the delivered normals.

## Measurements - Elevation angle cut off

	VLBI	DORIS	LASER	GNSS
AIUB/BKG	-	-	3 deg.	3 deg. *
DGFI	Tesmer 2004	-	0 deg.	-
ESA/ESOC	-	10 deg. *	10 deg.	10 deg. *
GFZ	-	-	10 deg.	10 deg.
GRGS	?	12 deg.	10 deg.	10 deg. *

\* Elevation dependent down-weighting law

# Measurements Weights

	VLBI	DORIS	LASER	GNSS
AIUB/BKG	-	-	1 cm	6 mm for DD
DGFI	According to NGS files	-	1 cm	-
ESA/ESOC	-	0.5 mm/s 50 mm for SLR	50 mm	10 mm phase 1 m code 50 mm for SLR
GFZ	-	-	1 cm	10 mm/7mm phase 1 m/70cm code
GRGS	?	0.3 mm/s	1 cm ?	3.5 mm phase 35 cm code

# Troposphere modeling

	VLBI	DORIS	LASER	GNSS
AIUB/BKG	-	-	Mendes-Pavlis	GPT + GMF + horizontal gradients (2h)
DGFI	IERS convention 2003	-	Mendes-Pavlis	-
ESA/ESOC	-	GPT + GMF piece wise linear (1/pass)	Mendes-Pavlis	GPT + GMF piece wise linear (2h)
GFZ	-	-	Mendes-Pavlis	GMF
GRGS	Guo&Langley (1h)	Guo&Langley (1/pass)	Mendes-Pavlis	Guo&Langley Piece wise (2h) no gradient

\* Troposphere parameters are reduced or not depending on the solutions



## Final remarks (1)

In general good agreement between different technics of the **same group**, but discrepancies remain for station displacement models for GRGS & DGFI.

→ Combination between two technics of the same center should be relevant.

## Final remarks (2)

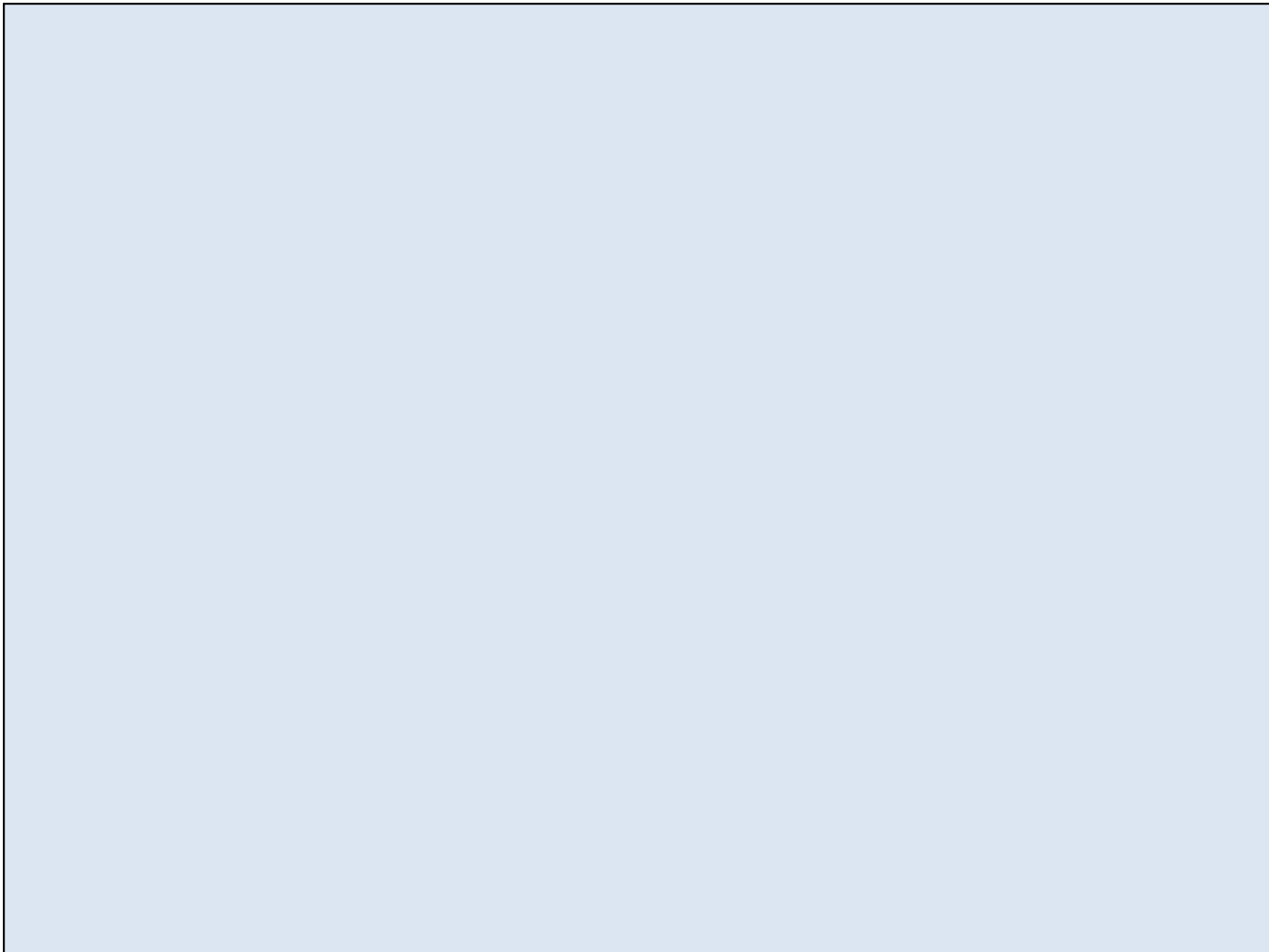
Many differences between the models used for two **different groups**.

-Station displacement models include or not oceanic loading and atmospheric loading

-Gravity field used for the LEO or GNSS & non-gravitational forces models differs (but may not have critical impact on stations coordinates & EOP)

- Relative weight differences between measurements matrices cannot be changed in combined normals.

→ Two solutions of different centers may not be comparable at a certain level.



# EOP modelling

VLBI	DORIS	LASER	GNSS
AIUB/BKG			
DGFI			
ESA/ESOC			
GFZ			
GRGS			

# Satellites used

	DORIS	LASER	GNSS	Multi technics (jason2 /Grace-AB)
AIUB/ BKG	-	<i>Lageos1/2</i>	<i>Gps &amp; Glonass (slr)</i>	?
DGFI	-	<i>Lageos1/2</i> <i>Etalon1/2</i>	-	
ESA/E SOC	<i>Spot 2-4-5</i> <i>Envisat</i> <i>Jason2</i>	<i>Lageos1/2</i> <i>Etalon1/2</i>	<i>Gps &amp; Glonass &amp; SLR</i>	?
GFZ	-	<i>Grace A/B</i> <i>GPS 5/6</i>		Gps & Grace-AB
GRGS	<i>Spot 2-4-5</i> <i>Envisat</i> <i>Jason2</i>	<i>Lageos1/2</i> <i>(Etalon1/2)</i>	<i>Gps (Glonass)</i>	?

# Gravity field differences

	DORIS	LASER	GNSS
AIUB/BKG	-	<b>S:</b> EIGEN-GL04C (50) <b>V:</b> C20/C30/C40 from Eigen <b>OT:</b> CSR4.0	<b>S:</b> GM3 (12) <b>V:</b> C21/S21 <b>OT:</b> CSR3.0
DGFI	-	<b>S:</b> GGM02S (30) <b>V:</b> J2 <b>OT:</b> GOT.00b	-
ESA/ESOC	<b>S:</b> EIGEN-GL05C (120) <b>V:</b> C21/S21 <b>OT:</b> FES2004	<b>S:</b> EIGEN-GL05C (20) <b>V:</b> C21/S21 <b>OT:</b> FES2004	<b>S:</b> EIGEN-GL05C (12) <b>V:</b> C21/S21 <b>OT:</b> Fes2004
GFZ	-	<b>S:</b> EIGEN-GL04C (120) <b>V:</b> AOD1B Grace RL04 <b>OT:</b> FES2004 <b>A:</b> Bode&Biancale+RL04	<b>S:</b> EIGEN-GL04C (120) <b>V:</b> AOD1B Grace RL04 <b>OT:</b> FES2004 <b>A:</b> Bode&Biancale+RL04
GRGS	<b>S:</b> EIGEN-GL04S (99) <b>V:</b> C21/S21 + drift + Sa +Ssa from Eigen <b>OT:</b> FES2004 + adm	<b>S:</b> EIGEN-GL04S (40) <b>V:</b> C21/S21 + drift + Sa +Ssa from Eigen-annual <b>OT:</b> FES2004 + adm	<b>S:</b> EIGEN-GL04S (12) <b>V:</b> C21/S21 + drift + Sa +Ssa from Eigen-annual <b>OT:</b> FES2004 + adm

**S:** Static Gravity field **V:** Variable part  
**A:** Atmospheric tides + gravity

**OT:** Oceanic tides