Unified Analysis Workshop and Common Research Projects

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Unified Analysis Workshop

- GGOS, IERS, IGS, IVS, ILRS, IDS, IGFS
- Focus on both, problems of the individual techniques and problems common to more than one technique
- Increase the common understanding of all techniques for each individual technique as they contribute to a GGOS
- Positive feedback from all services (support, date)
- Proposals for common projects were made

- Ca. 2.5 days
- Before the AGU 2007 Meeting: Wednesday to Friday evening
- San Francisco area
- IERS will care about the organization of the workshop

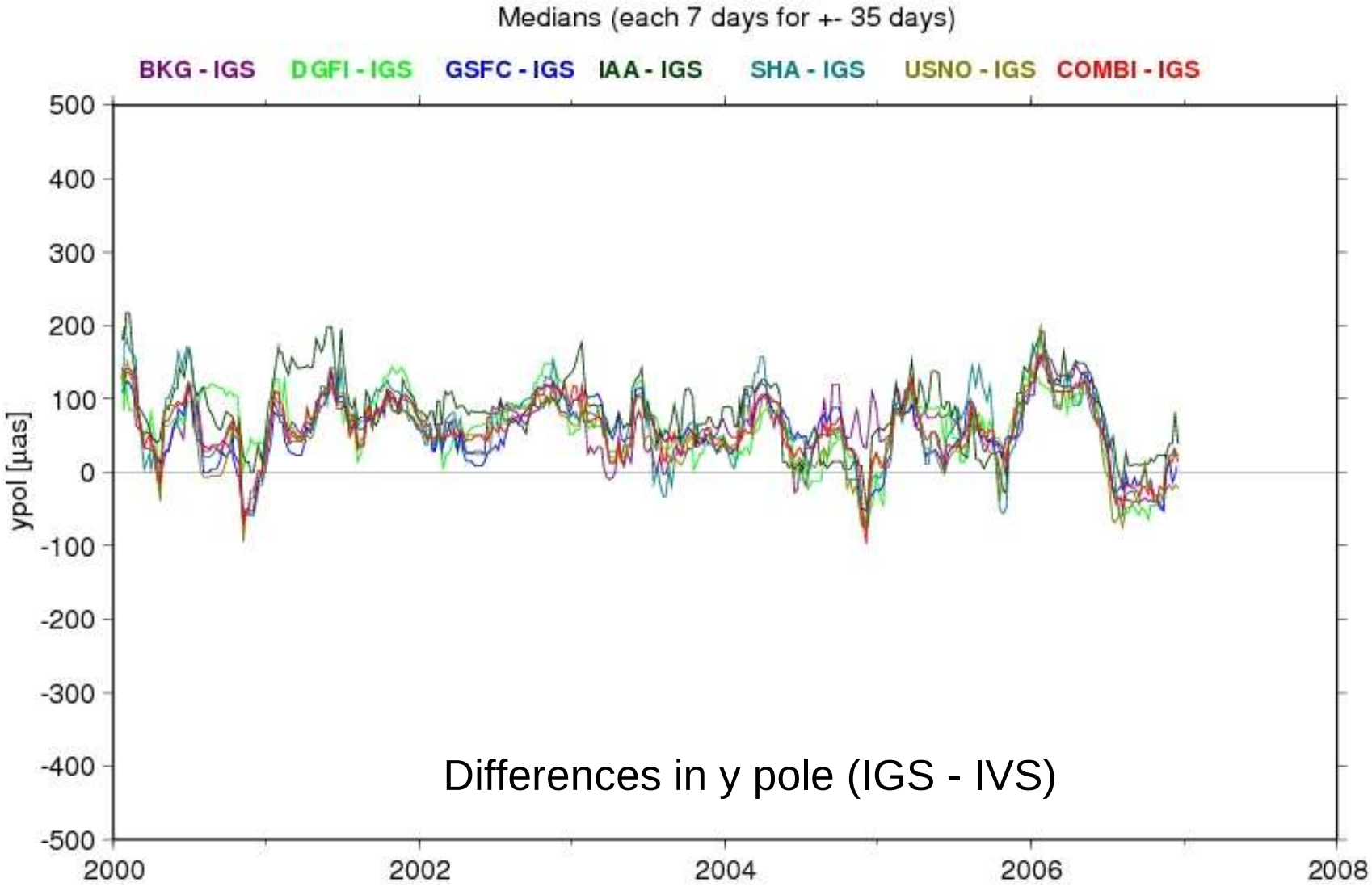
Common Research Projects

Possible “common research projects” (ILRS AWG, IVS ACW):

- Troposphere mapping and initials
- Ocean and other loading effects
- Subdaily models
- Parameter intervals
- Weighting and constraints in combination
- Parameterization standards and a priori values/models
- Rapid ERP combination
- Troposphere comparison and combination (IGS, IVS, IDS)
- Low degree harmonics combination
- LOD and nutation rates from satellite techniques
- Systematic effects between techniques (local ties)
- Local ties on satellites (SLR to GNSS, common orbits, …)
- Meta Data Standards for GGOS Portal
- Gravity field (Bifrost: GPS and absolute gravimetry)
- Orbits with new gravity fields, satellite co-location
- Relationship: geometry and altimetry and gravity
- Representation of datum (physical, geometrical)

Common Research Projects

Investigations of systematic EOP differences between techniques



Unified Analysis Workshop: Next Steps

- Distribute a first circular (date, time , place, theme)
- Identify just a few common research projects from the huge list ↙ proposal to Analysis Coordinators, Chairs
- First ideas on the sessions to be held
- Iteration with ACs and Chairs
- Second circular

GGOS Troposphere Combination Project

Goal: **Rigorous Combination of troposphere enith delays from GPS, VLBI, and DORIS**

IGS, IVS, IDS:

- Generation of daily (session) SINEX files containing:
  - Site coordinates: daily resolution
  - Troposphere zenith delays (and gradients): 2-h and 1-day, piece-wise linear (?)
  - Polar motion and UT1-UTC and their rates: daily
- Implement the same troposphere modeling standards:
  - Use the same mapping function (e.g. NMF or GMF)
  - Use the same a priori troposphere model for the dry delay
- Problem: VLBI not observing from 00:00 to 24:00 UT

GGOS Portal Meta Data Project

Goal: **Get a first, very simple meta data flow for the individual products of the IAG Services**

- Define a simple meta data standard
- Encourage IAG Services to deliver meta data in this format for all their (routine) products
- Develop a first simple database of meta data (portal) and meta data search tools etc.

Daily Rapid IERS EOP Product

Idea: Combination of VLBI Intensive Sessions (e-VLBI) with GPS rapid products to obtain highly precise rapid ERP solutions

IGS:

4. Generation of SINEX files by the ACs on a daily basis including station coordinates and EOPs (rapid product)
5. Generation of combined intra-technique SINEX files by the IGS AC on a daily basis

IVS:

8. Generation of daily SINEX files by the ACs for the VLBI Intensives (1hour) using e-VLBI
9. Generation of daily combined intra-technique SINEX files by the IVS AC

IERS:

12. Combination of the VLBI and GPS SINEX files (including local ties) to generate rapid daily ERPs

Daily Rapid Product: Parameter Space

Parameter space for the rapid IERS combination; ideal complementarity of VLBI and GPS:

- **GPS: Stable reference frame and polar motion**
- **VLBI: UT1**
- **SLR: ???**

Parameter Type	VLBI	GPS/ GLON.	DORIS/ PRARE	SLR	
Nutation	X				Earth Rotation
Polar Motion	S	X	S	S	
UT1	X				
Length of Day (LOD)		S	S	S	
Coord.+Veloc.(ITRF)	S	X	S	S	ITRF
Geocenter		S	X	X	

X: Essential Contribution

S: Parameter Setup

Daily Rapid IERS EOP Product

Questions to the IGS ACs:

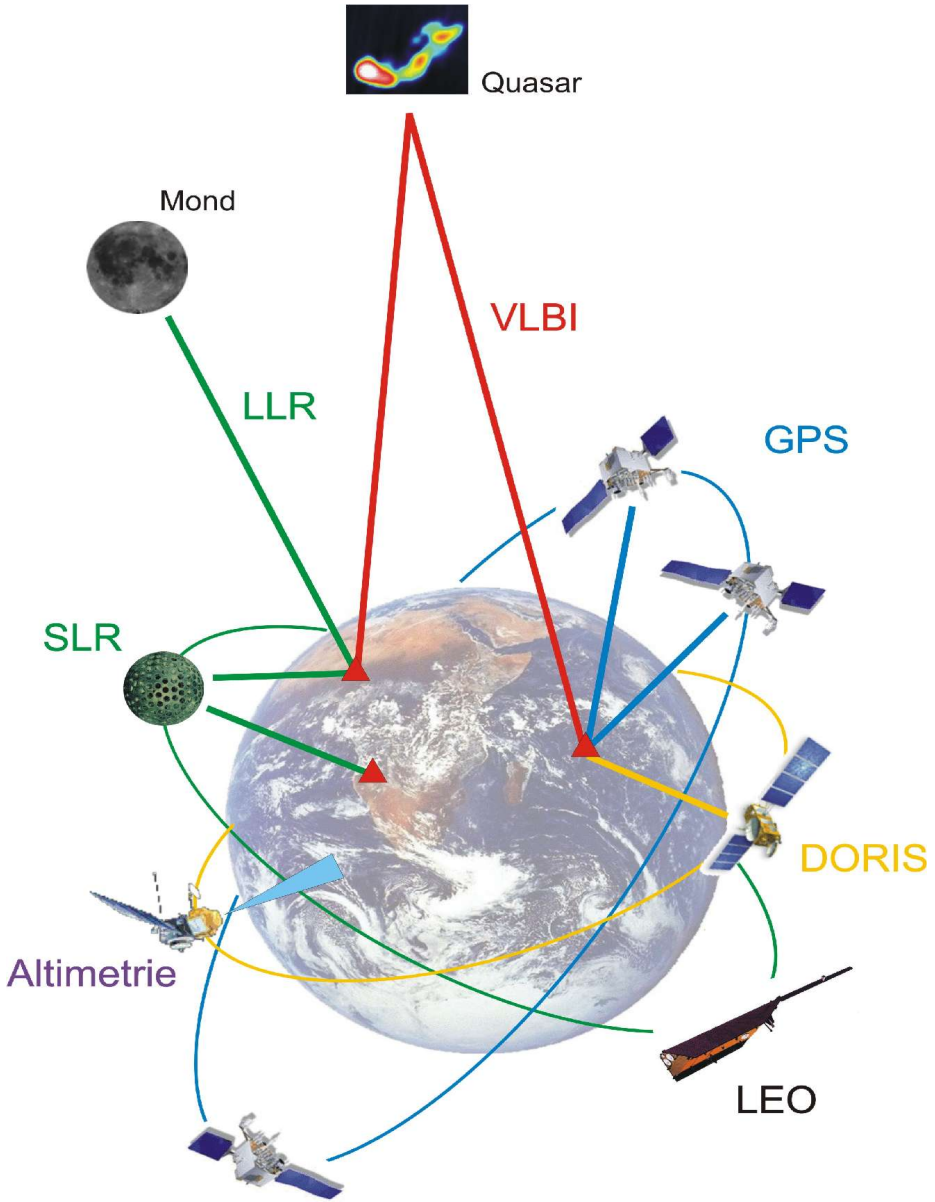
- Would you be ready to submit daily SINEX files from your rapid solutions containing site coordinates and EOPs ?
- When could a routine submission of such rapid SINEX files to an IGS data center start at your AC ?

Questions to the IGS Analysis Coordinator:

- What would be the effort needed to implement the generation daily SINEX files based on the rapid SINEX files from the individual AC SINEX files mentioned above ?
- When could a routine generation of such a daily combination start ?

Remark: A first test combination of VLBI intensives and GPS rapid solutions into a combined product (for polar motion and UT1) could be done based on only one IGS AC and one IVS AC …

GGOS-D Project



Integration of Space Geodetic Techniques as the Basis for a Global Geodetic-Geophysical Observing System (GGOS-D)

Partners:

GFZ, DGFI, GIUB, BKG

GGOS-D: Innovative Guidelines

- Application of unified/common standards and parameterizations for all participating software packages

- Enlargement of the parameter space leading to the interesting combination of geometry, Earth rotation, gravity, and possibly sea level

- Inclusion of SLR, VLBI, GPS, altimetry and LEOs. Additional parameterrs are quasar coordinates, nutation offsets and rates, troposphere zenith delays and gradients, low- degree harmonics coefficients of the gravity field

- Higher temporal resolution, with not only weekly, but daily solutions and subdaily resolution of Earth rotation parameter

- SINEX as the standard for the exchange of all parameter types and solution types

GGOS-D: Generation of Homogeneous Time Series

Technique	Work Package	Institution	Software Package	Time Period
SLR	WP3200	DGFI	DOGS	1984-2005
SLR	WP3200	GFZ	EPOS	1984-2005
VLBI	WP3300	DGFI	OCCAM	1984-2005
VLBI	WP3300	GIUB/BKG	CALC/SOLVE	1984-2005
GPS	WP3400	GFZ	EPOS	1994-2005
GPS	WP3400	GFZ	Bernese V5.0	1994-2005
LEOs	WP3500	GFZ	EPOS	2000-2005
Altimetry	WP3600	DGFI	DGFI Software	1992-2005

GGOS-D: Advanced Modelling

2nd Iteration of SINEX Solution Generation:

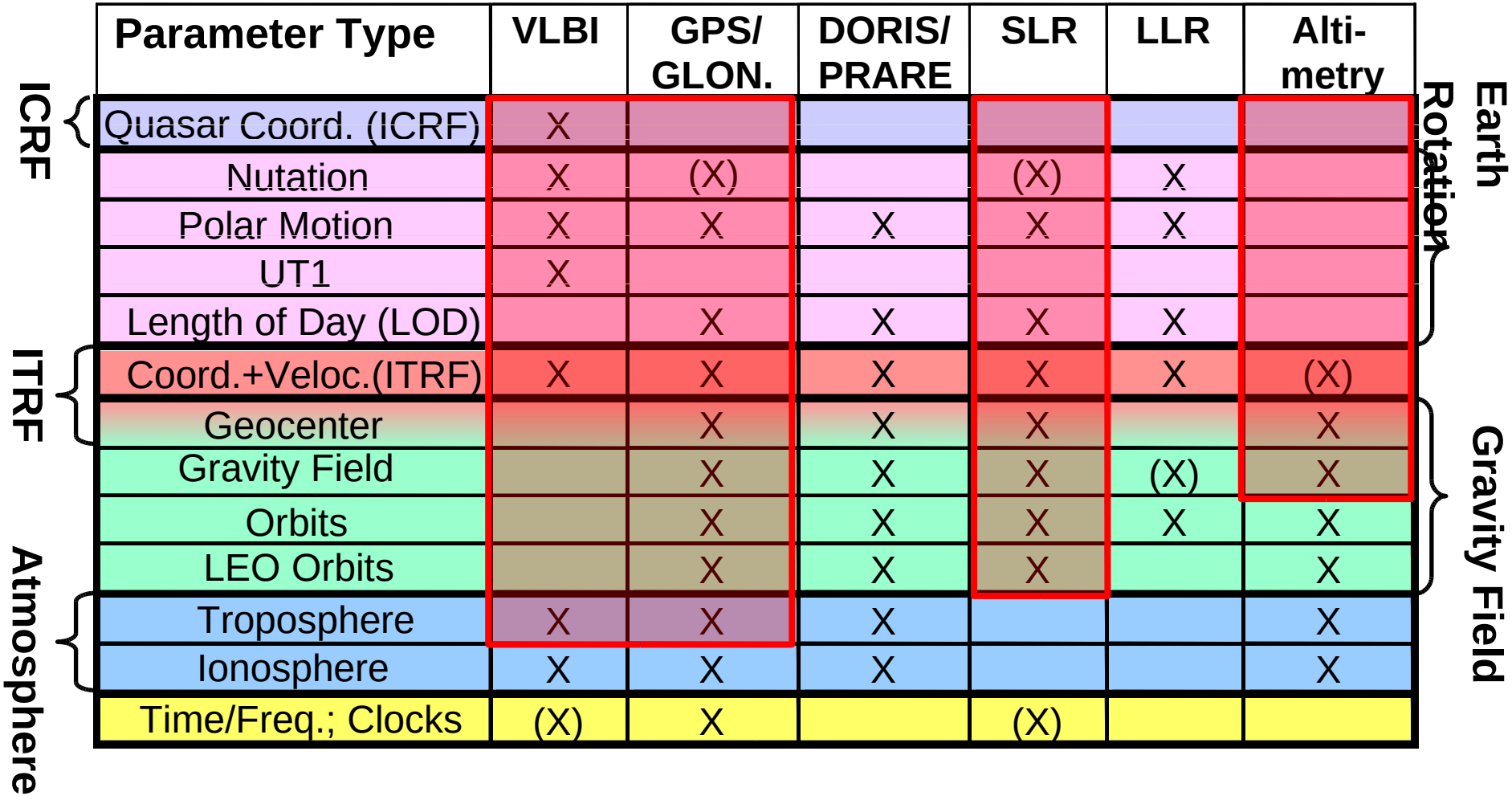
- Higher-order ionospheric corrections (GPS)
- Absolute antenna phase center variations (GPS)
- New troposphere mapping functions (VMF1; using ECMWF data; GPS and VLBI)
- Hydrostatic a priori delay from ECMWF data (GPS and VLBI)
- IERS 2003 Standards and the same models for site motion (e.g. ocean loading, …), troposphere, …

GGOS-D: Parameterization

2nd Iteration of SINEX Solution Generation:

- Site coordinates (piece-wise constant; 1-day)
- Troposphere zenith delays and gradients (piece-wise linear; 2-h and 1-day, resp.; same mapping functions; GPS and VLBI)
- Polar motion and UT1-UTC (piece-wise linear; 1-h)
- Nutation offsets and rates (1-day; VLBI and GPS, resp.)
- Low-degree harmonics coefficients of Earth's gravity field (piece-wise constant; 1-day; SLR, GPS, and LEOs; tests to include altimetry)
- Quasar coordinates (1-day; VLBI)

GGOS-D: Parameter Combination Space



	Parameter Type	VLBI	GPS/ GLON.	DORIS/ PRARE	SLR	LLR	Alti- metry	
ICRF	Quasar Coord. (ICRF)	X						Earth Rotation
	Nutation	X	(X)		(X)	X		
	Polar Motion	X	X	X	X	X		
	UT1	X						
	Length of Day (LOD)		X	X	X	X		
ITRF	Coord.+Veloc.(ITRF)	X	X	X	X	X	(X)	Gravity Field
	Geocenter		X	X	X		X	
	Gravity Field		X	X	X	(X)	X	
	Orbits		X	X	X	X	X	
	LEO Orbits		X	X	X		X	
Atmosphere	Troposphere	X	X	X			X	
	Ionosphere	X	X	X			X	
	Time/Freq.; Clocks	(X)	X		(X)			