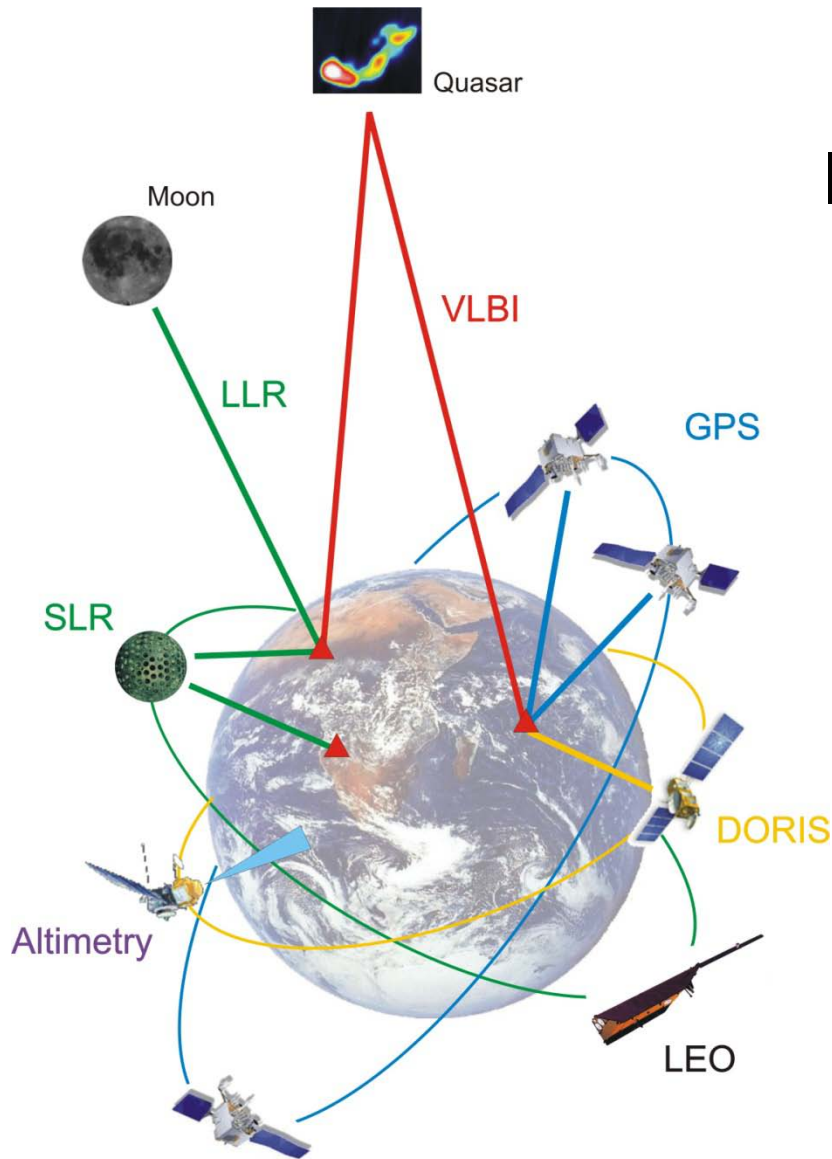




IERS - Products and Future

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Present Status of IERS Product Generation



- **ITRF:** ITRF2008 nearly complete, generation from weekly (session) SINEX files, ITRF and EOPs together
- **EOP:** Based on technique-specific combined EOP time series, consistency to ITRF not fully realized
- **ICRF:** ICRF2 based on one analysis center, no combination with ITRF and EOP
- **IERS Conventions:** continuous updates, new printed version in 2010, not followed in all details
- **GGFs:** Re-organized, additional products, new services begin on January 1, 2010
- **CRCs:** Dissolved
- **Gravity:** No connection to gravity, no vertical datum

Combined Products with Different Latency



Product Type	Main Parameters	Generation Cycle	Maximum Latency	Based on
Multi-Year	ITRF, EOPs, ICRF , static gravity field; time series of parameters (site coo. etc.)	Yearly	Maximum 1 year	Reprocessed high-accuracy time series from each technique
Weekly “Final”	EOPs , site coordinates, gravity field variations, ...	Weekly	3 weeks	Based on the “final” routine intra-technique combined products
Daily “Rapid”	EOPs, site coordinates, tropospheric delays , etc. = near real-time monitoring	Daily	1 day	VLBI Intensives and IGS Rapids and SLR/DORIS
Daily “Predicted”	EOPs , ...	Daily	1 day	Combined daily rapid IERS products

1. Multi-Year Solutions: IERS200x



- **ITRF2008** is another big step forward (consistency, quality, time series, ...)
- **Improvements are:**
 - Re-analysed combined SINEX files from IGS, ILRS, IVS and IDS
 - For the first time reprocessed GPS series included
 - Technique-specific problems recognized in ITRF 2005 corrected
 - Additional local ties
- **Some open issues:**
 - Treatment of nonlinear station behavior and seasonal/daily signals
 - Combination of UT1 from VLBI and LOD from satellite techniques
 - Improvement in local ties
 - Inclusion of additional parameter types

- **ICRF2 – second realization of the ICRS**
- Work of IERS/IVS working group on ICRF2 (2006-2009)
- Compared to the original ICRF:
 - 14 years additional observations
 - Many advances in observing, analysis and modeling techniques
 - 5 times as many sources (3414)
 - Noise floor 5 times lower (40 microarcsec)
 - Axis stability 2 times better (10 microarcsec)
 - 295 defining sources rigorously selected for stability and structure
- Adopted by XXVII IAU General Assembly (Aug 13, 2009)
 - ICRF2 resolution passed without dissent
 - ICRF2 becomes the Fundamental Astrometric Reference Frame on 01 January 2010



- **Next version of IERS201x products:**
 - Common standards in modeling, parameterization, processing strategy to be used in the reprocessing by the individual analysis centers (ACs) across the techniques
 - Agreement on Standards / Modeling / Parameterization for the next generation of SINEX files (taking into account IGS reprocessing options)
 - Include quasar coordinates and nutation offsets from VLBI: combination of the three parameter types:

$$\mathbf{IERS201x = TRF201x + EOP201x + CRF201x}$$

- Work on the combination of UT1 and LOD (VLBI and satellite techniques)
- Agree on common EOP parameterization and a priori values (subdaily resolution ?)

2. Routine Weekly SINEX Generation: Status



- <http://dms.iers.org/info/listFileCPP.php>
- <http://dms.iers.org/info/StatisticsCPP.php>
- All intra-technique solutions in time

Technique	Institution	Continue Submiss. ?	ITRF2005 consist. ?	Param. Types ?	Shortest Delay ?
IGS	NRCan	Yes	Yes	Co, xp,yp,xpr,ypr, lod	10 (20)
ILRS	ASI	Yes	Yes	Co,xp,yp,xpr,ypr, lod	10 (15)
IVS	BKG	Yes	Yes	Co,xp,yp,Ut1,xpr, ypr,lod,de,dp	8-14 (30)
IDS *	IGN	Yes	Yes	Co,xp,yp,xpr,ypr	30 (45)
Combined	GRGS	Yes	Yes	Co,xp,yp,de,dp rates	VLBI dep.

* Individual analysis center (Pascal Willis) , weekly combination in preparation

3. Daily Rapid IERS EOP Product



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

IGS:

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

IVS:

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

IERS:

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

Daily Rapid Product: Parameter Space



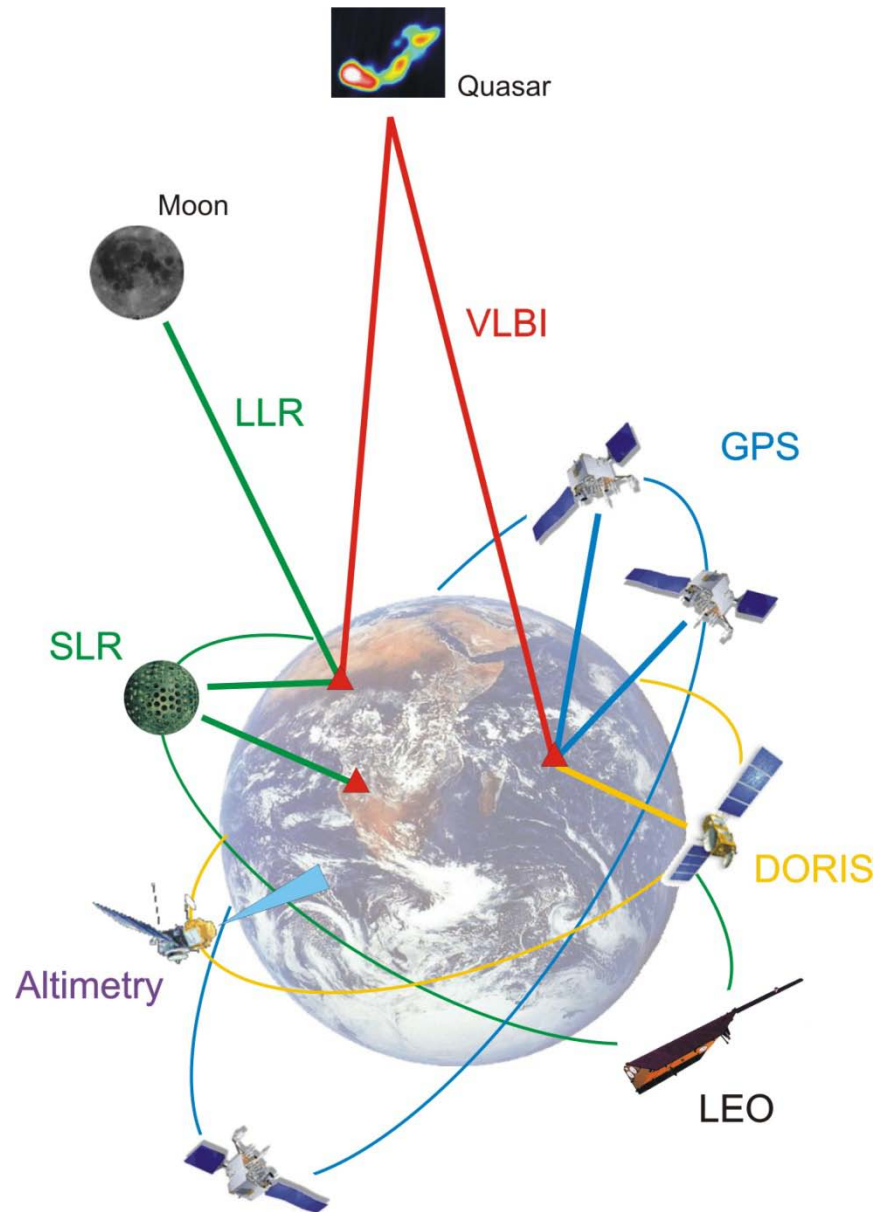
Parameter space for the rapid IERS combination;
ideal complementarity of VLBI and GPS:

- GPS: Stable reference frame and polar motion
- VLBI: UT1
- SLR, DORIS: Geocenter ?

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

X: Essential Contribution

S: Parameter Setup



**Thank you for
your attention !**



Questions to the IGS and IVS ACs:

- Would you be ready to submit daily (VLBI: intensive sessions) SINEX files from your rapid solutions containing site coordinates and EOPs ?
- When could a routine submission of such rapid SINEX files start at your AC ?

Questions to the IGS and IVS Analysis Coordinators:

- What would be the effort needed to implement the generation of daily (VLBI: intensive sessions) 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 ...

Remark: Near real-time monitoring of the global reference frame (earthquakes, dislocation of antennas, ...)

Goal: Rigorous Combination of troposphere zenith 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. GMF)
 - Use the same a priori troposphere model for the dry delay
- Problem: VLBI not observing from 00:00 to 24:00 UT



- **Proposal for next IERS201x:**

- Parameterization:**

- Include quasar coordinates and nutation offsets from VLBI
 - Include low-degree harmonics from SLR
 - Setup EOPs with $\frac{1}{2}$ -day resolution, piece-wise linear, offsets at 0:00, 12:00 and 24:00 UTC
 - Agree on common interpolation method for a priori EOPs
 - Include GPS solutions available from reprocessing efforts

- Modeling Standards:**

- Troposphere mapping function GMF
 - Ocean loading from FES2004
 - No atmospheric loading ???