

IERS EOP PREDICTIONS

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Current IERS EOP Predictions (1)

- Automated procedure that utilizes both geophysical forecasts and prediction algorithms
 - UT1: AR predictions + AAM forecasts (out to 7.5 days)
 - Polar motion: LS+AR predictions
- Short-term accuracy depends on
 - Quality of last observed data point(s)
 - Quality of geophysical forecast
 - Algorithm

Current IERS EOP Predictions (2)

- Multiple solutions per day
 - 0310 UTC, 0910 UTC, 1710 UTC, 2110 UTC
 - Timed to take advantage of latest IGS products
- Solutions take ~10 minutes to complete
 - Time split between data downloads and software runtime
- Solutions available at USNO DC and Naval Observatory Flagstaff Station (NOFS)
 - Provides redundant capability required for an operational product

Current EOP Prediction Drivers

- Most EOP predictions users are:
 - Real-time EOP users with operational needs
 - Interested in nowcasting
 - Quality of predictions important but also need predictions to be available on-time
 - Reliability as important as quality
 - Interested in short-term predictions
 - More effort spent improving quality of short-term predictions

2012 IERS EOP Capability

Prediction Length (days)	PM-x (mas)	PM-y (mas)	UT1-UTC (ms)
-10	0.02	0.03	0.018
0	0.05	0.06	0.035
1	0.35	0.25	0.063
5	2.01	1.35	0.256
10	3.92	2.76	0.662

Current Concerns

- Most low-quality predictions are initiated by problematic, low-latency data
 - Some quality control (QC) internal to combination and prediction process, but problems still occur
 - Some problems due to incomplete QC checking
 - Some problems cannot be resolved with limited information
 - More, different quality observations could help
- Data input is not optimized for 4 EOP solutions per day
 - Need better temporal distribution
- Data combination algorithm not optimal
 - Investigating alternative methods

Future EOP Predictions

- Difficult to improve quality of observations
- Difficult to improve quality of algorithms
- Can improve latency of
 - EOP solutions
 - Observations

Future EOP Solution

- Currently, 4 EOP solutions per day
 - Only 1710 UTC solution monitored
 - Other solutions have automated QC
 - Catches most (not all) problems – Caveat emptor
- Future will have more frequent EOP solutions
 - Current plans are to provide EOPs on demand
 - As new observations are provided, new EOP solutions will be generated
 - Would likely require new data formats
- Automated processes can be improved, but only so much
 - How can the quality of the solution be improved?

USNO Operations Center

- Designed to provide 24/7 monitoring of real-time USNO data products
 - Including EOPs
 - VLBI correlation
- Will act as a single point of contact for USNO operational products
- Hardware is installed
- Initial operations scheduled for > 1 Oct 2013
 - Initial EO operations will be later (within 5 years)

Future Data Requirements

- Optimal solutions will be achieved if
 - Data latency is minimized
 - EOP solution latency is minimized
 - More frequent solutions
 - EOP solution run-time is minimized
 - EOP data format accommodates new paradigm and is user (computer) friendly
 - Useful feedback provided by IERS RS/PC to data contributors

Current Data Latency/Accuracy

Input	Latency	Refresh rate	PM Accuracy	UT1/LOD Accuracy
AAM	~18-42 hours	1/day		~60 μ s/day
GPS (Ultras)	~15-21 hours	4/day	~20 μ as	~15 μ s/day
SLR	48-72 hours	1/day	~200 μ as	
VLBI Intensives	~8-32 hours	1-2/day		~20 μ s
VLBI 24-hour	10-17 days	2/week	~200 μ as	~5 μ s

Future Data Latency/Accuracy?

Input	Latency	Refresh rate	PM Accuracy	UT1/LOD Accuracy
AAM	<15 hours	4/day	<200 μ as/d	<50 μ s/d
OAM	<24 hours	1/day	<200 μ as/d	
DORIS	<24 hours	1/day	~100 μ as	
GPS (Ultras)	~15-21 hours	4/day	~20 μ as	~10 μ s/day
LLR	<1 hour	1-6/day [§]		~50 μ s
Laser gyroscope	~1 hour	several/day	<200 μ as/d	<50 μ s/d
SLR	<24 hours	2/day	~100 μ as	
VLBI Intensives	<2 hours	2+/day		~10 μ s
VLBI 24-hour	2 days	1/day	~100 μ as	~5 μ s

[§] will likely have a phase of moon dependence

Summary

- Ways to improve EOP predictions:
 - Reduce latency of EOP solutions
 - Reduce latency of EOP observations
 - Additional, improved EOP observations
 - Additional, improved geophysical forecasts
 - Improved combination algorithm
 - Improved quality control throughout
 - Improved diagnostic information to contributors

Backups