Computation of the IGS Final Troposphere Product by the USNO

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Purpose

- Describe Processing of IGS Final Troposphere by USNO and Transition from JPL
- Status Update of IGS Final Troposphere Processing
- Future Plans

Software Setup & Processing

- Precise Point Positioning Method
- 27 hour Observation Window
- Fixed GPS Clocks and Orbits: IGS Finals
- Elevation Angle Cutoff: 7 degrees (Receiver Dependent)
- Troposphere Mapping Function: GMF (Global Mapping Function)
- A Priori Troposphere Estimate: Dry Niell Model
- Temporal Resolution: 5 minutes
- Relative A Priori Sigmas: 1 mm (ZPD), 0.1 mm (Gradients)
- Latency: 3 weeks
- First Day Processed by USNO: DOY 107 of 2011 (April 17, 2011)
- Not a Combination Production Like Other IGS Products
- Generated Using *Bernese 5.0 Software*
- RINEX Data Pre-Filtered for Missing Data
- Post Estimate Screening for Product Quality

Transition from JPL

- Troposphere Estimate Comparison between JPL and USNO over 25 Days (DOYs 050-074 of 2011) for 18 Globally Distributed IGS Reference Stations
- ZPD, North and East Component Estimated

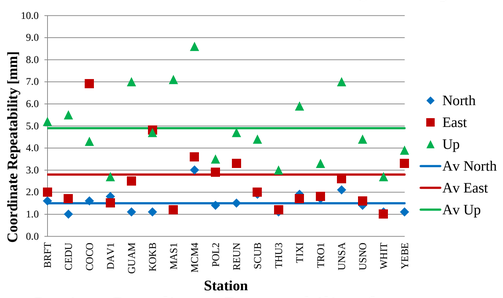
	Std. Dev. [mm]	RMS [mm]	Mean [mm]
ZPD	2.36	2.95	0.66
North	0.36	0.42	-0.05
East	0.36	0.42	0.00

Average Standard Deviation, RMS, and Mean for 25 Day Comparison Period

- Calculated Average Mean Close to Zero
- No Filtering Applied: Results Skewed Slightly Larger Due to Outliers
- Values Consistent with CONT08 VLBI and GPS Comparisons

Coordinate Repeatability

- Check for Internal Quality of Processing

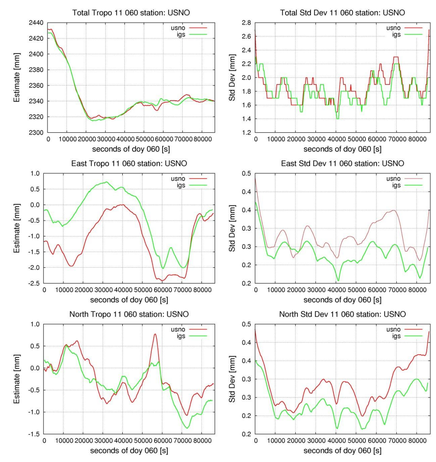


Station Coordinate Repeatability for Comparison Stations

- 14 Day Test Period: DOYs 058-071 of 2011
- Some Skewed High as a Result of Stations' Partial Day of Data

Estimate Variability

- Station: USNO for DOY 060 of 2011
- Similar Patterns in the Estimates and Formal (Software) Standard Deviation
- Possible Variability Causes: Modelling Techniques, A Priori Setup, Filter Parameters

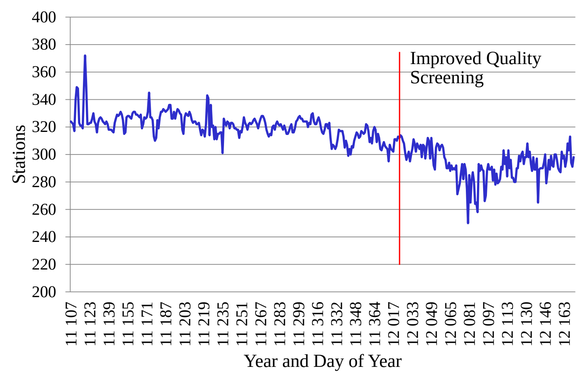


Troposphere Estimates for Station USNO on DOY 060 of 2011

Current Operations

Stations Per Day

- Process ~300 stations/day
- Decreases Due to Decreased Availability of Station Data at 3 weeks Latency and Improved Post Processing Screening for Data Quality
  - Initial ~100 days Processed with Latency of >3 weeks



Number of Stations/Day Since Start of USNO IGS Final Troposphere Estimates Production

Coordinate Repeatability

- Coordinate Comparison of ~300 Stations Over Each Two Week Period for DOYs 100 through 169 of 2012
- Outliers Screened Out (~10 Stations/Period) are Same Stations Filtered for Quality at End of Troposphere Estimate Processing

DOYs of 2012	N [mm]	E [mm]	U [mm]
100-113	1.84	2.58	4.70
114-127	1.67	2.87	5.68
128-141	1.83	3.27	5.61
142-155	1.75	2.89	5.61
156-169	1.65	2.67	5.02
average	*1.75*	*2.85*	*5.33*

Station Repeatability Associated with IGS Final Troposphere Estimates in Two Week Increments

Future Plans

- Incorporate the Recommendations of the Troposphere Working Group
- Explore and Implement Methods to Increase Number of Stations Processed
- Incorporate Other GNSS Signal Data (Maybe Improv Estimates at Higher Latitudes?)
- Repro2 Processing

Conclusions

- Smooth Transition from JPL in 2011 with a Comparable Estimate
- Number of Stations Being Produced Has Decreased as Result of Improved Data Quality Screening
- Station Repeatability Consistent Over Time Demostrating Excellent Internal Stability of the Processing

Troposphere Products Available Online: ftp://maia.usno.navy.mil/GPS/tropo/

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