

Rover Station Positional Accuracies from OPUS as a Function of Reference Station Spacing and Rover Station Occupation Time

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OPUS Introduction

- Web-based tool to process GPS data.
- Provide access to the ITRF and US National Spatial Reference Systems.
- Provide accurate, reliable and consistent geodetic coordinates.
- Provide coordinate accuracies to within a few centimeters.
- Provide GPS solutions in a timely fashion.

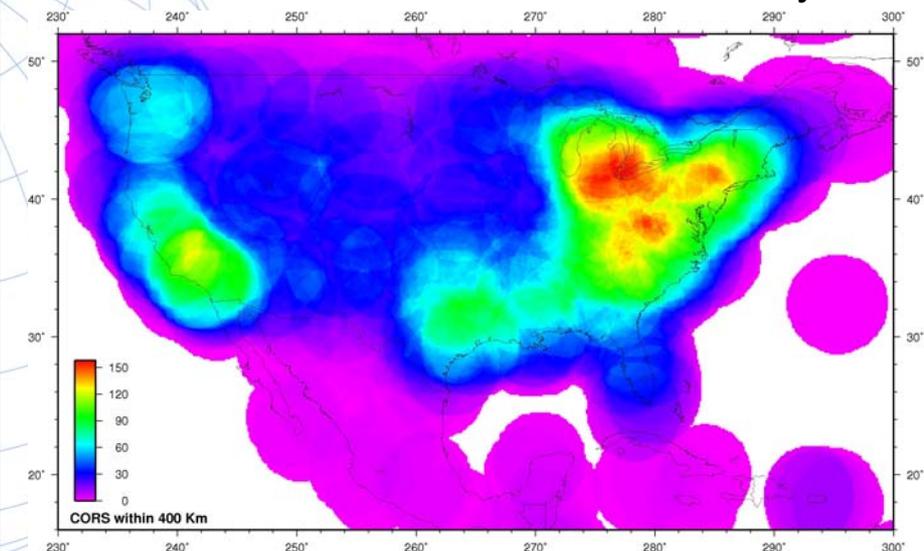


CORS Reference Network

- Multi-purpose cooperative endeavor. 1300+ government, academic and privately owned stations.
- Geodetic quality receivers, antennas.
- Data sent to National Geodetic Survey (NGS).
- NGS analyzes all data on a nightly basis.
- Free RINEX data access – 1994 to present.
- Network expands by 15 stations a month.



CORS Reference Station Availability

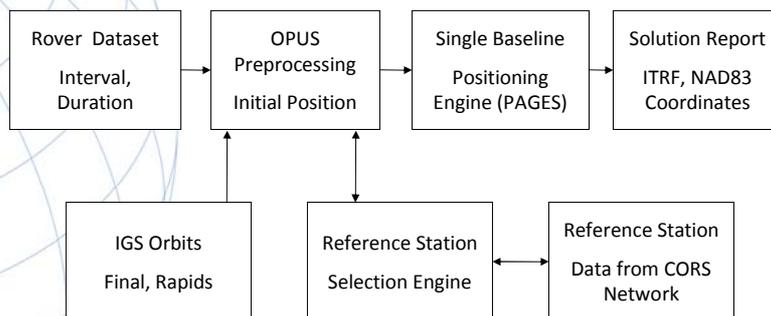


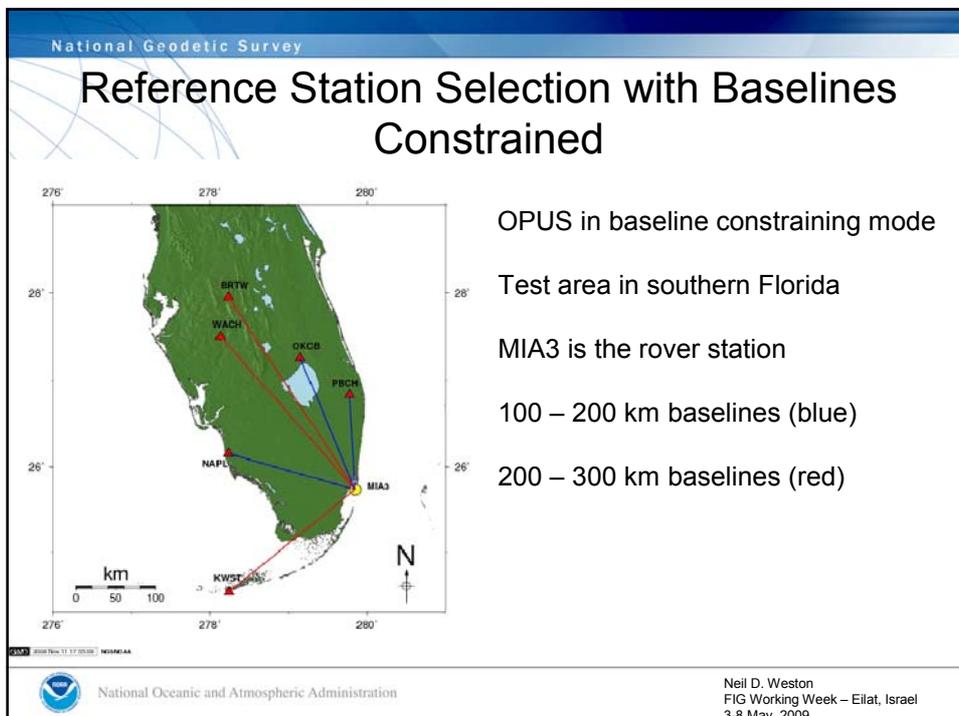
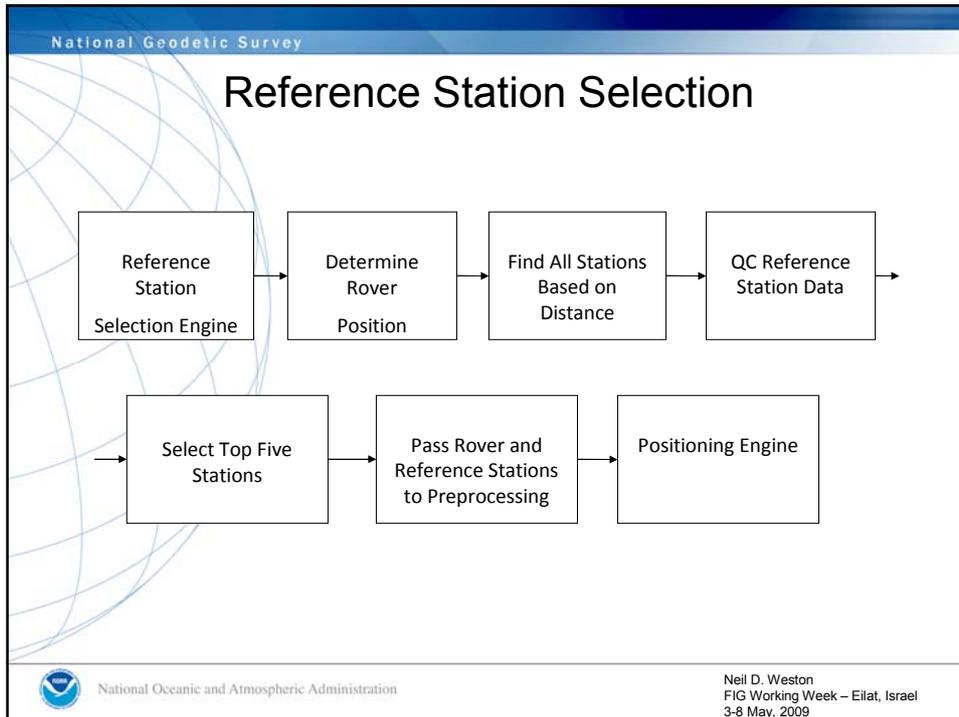
Rover Dataset Characteristics

- 781 CORS stations arbitrarily chosen as rovers.
- Rovers are located in United States, Mexico and Caribbean.
- Rover spacing allows for baselines from 100-600 km to be easily formed with other CORS stations.
- Data taken on day 34, 2007.
- Rover datasets range from one to five hours in duration.



OPUS Processing Stages





OPUS Processing Methodology

- Constrain baseline length between rover and reference stations to one of six cases.
- Cases: 100-200, 200-300, 300-400, 400-500, 500-600, 600+ kilometers.
- Break rover datasets into subsets ranging from one to five hours in duration.
- 781 stations, six constraining ranges, five durations for each – 23,400 unique solutions.
- Process w/ PAGES software.



OPUS Processing Methodology

- Integer fixing, relative troposphere modeling (GMF *a priori* model) and relative antenna patterns are typically implemented for baseline processing of this nature.
- Ion-free linear combination of L1 and L2.
- Elevation-dependent weighting scheme.
- ITRF2000 coordinates.
- Compare results with NGS published values.

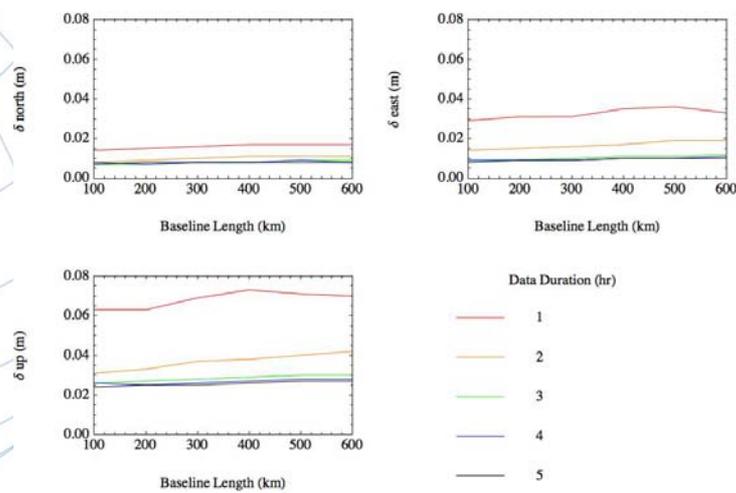


Baseline Length Groups

	1<100 km	100-200 km	200-300 km	300-400 km	400-500 km	500-600 km
δ North (m)	0.009±0.003	0.009±0.003	0.010±0.004	0.010±0.004	0.011±0.004	0.011±0.004
δ East (m)	0.014±0.009	0.015±0.009	0.015±0.009	0.017±0.011	0.017±0.011	0.017±0.010
δ Up (m)	0.034±0.016	0.035±0.016	0.037±0.019	0.039±0.020	0.039±0.019	0.039±0.018



Coordinate Component Errors versus Baseline Length

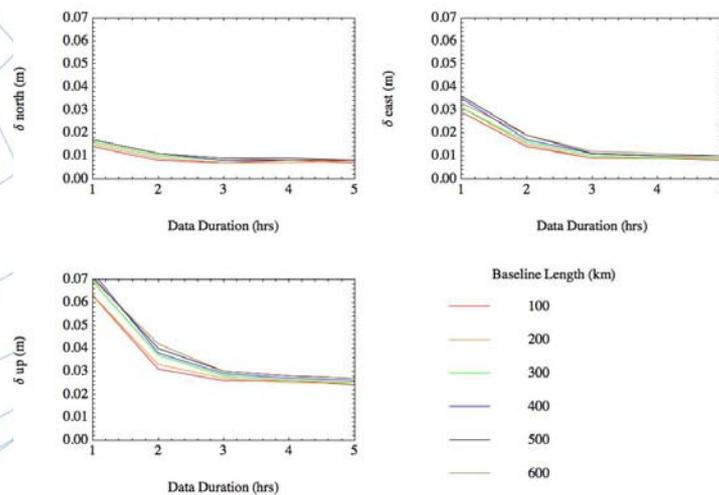


Data Duration Groups

	1 hr	2 hrs	3 hrs	4 hrs	5 hrs
δ North (m)	0.016 \pm 0.001	0.010 \pm 0.001	0.008 \pm 0.001	0.008 \pm 0.001	0.008 \pm 0.001
δ East (m)	0.033 \pm 0.003	0.017 \pm 0.002	0.010 \pm 0.001	0.010 \pm 0.001	0.009 \pm 0.001
δ Up (m)	0.068 \pm 0.004	0.037 \pm 0.004	0.028 \pm 0.002	0.027 \pm 0.001	0.026 \pm 0.001



Coordinate Component Errors versus Occupation Time



Conclusions

- Initial results show that OPUS processing depend primarily on duration of dataset and to a much lesser extent, the length of the baseline between rover and reference station.
- Up component most sensitive for datasets less than two hours.
- One hour datasets had largest peak to peak errors while longer datasets had significantly smaller errors.



- Troposphere refraction model in OPUS began to lose validity for baselines longer than 500 km.
- Poor troposphere modeling for short datasets was a significant contributor for large errors in the vertical.
- For short datasets, a change was implemented to estimate troposphere every 30 minutes.





Thank you for your attention!

