

Comparing 2-Hour, 4-Hour, 8-Hour, 16-Hour and 24-Hour OPUS Solutions

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Thesis:

I am often asked how long of an occupation is required to get a 'Good' OPUS Static solution on a point. Typically the primary concern is elevation data.

In this note I compare 2, 4, 6, 8, 16 and 24-hour occupations at the same point and tabulate the results. As suggested by the NGS, I find that 4 hour occupations are a minimum occupation, however I would suggest that 6 – 8 hours is a more reasonable observation time when elevation is important.

Test Details:

A single 24-hour dataset for the Price Utah CORS station was used for this demonstration. The August 19, 2009 file is available online from NGS CORS at <http://www.ngs.noaa.gov/cors/rinex/2009/200/puc1/puc12000.09o.gz>.

TEQC (available from UNAVCO) was used to window the single 24-hour file into 12 2-hour files (named 2H__), 6 4-hour files (named 4H__), 4 6-hour files (named 6H__), 3 8-hour files (named 8H__), 1 16-hour file (named 16H) and 1 24-hour file. All of the time windowed files are available online at http://www.magprogps.com/ms/OPUS_Occupations/puc1200rinex.zip.

All of the occupation files were submitted to OPUS on August 27, 2009 and processed with precise ephemeris. Since PUC1 is an active CORS site, PUC1 was excluded from ALL OPUS solutions (we don't want to use the data under consideration to process against.)

PUC1 was chosen as it is extremely stable: it is the oldest continuously operating reference station in Utah and I know it to have excellent stability over time.

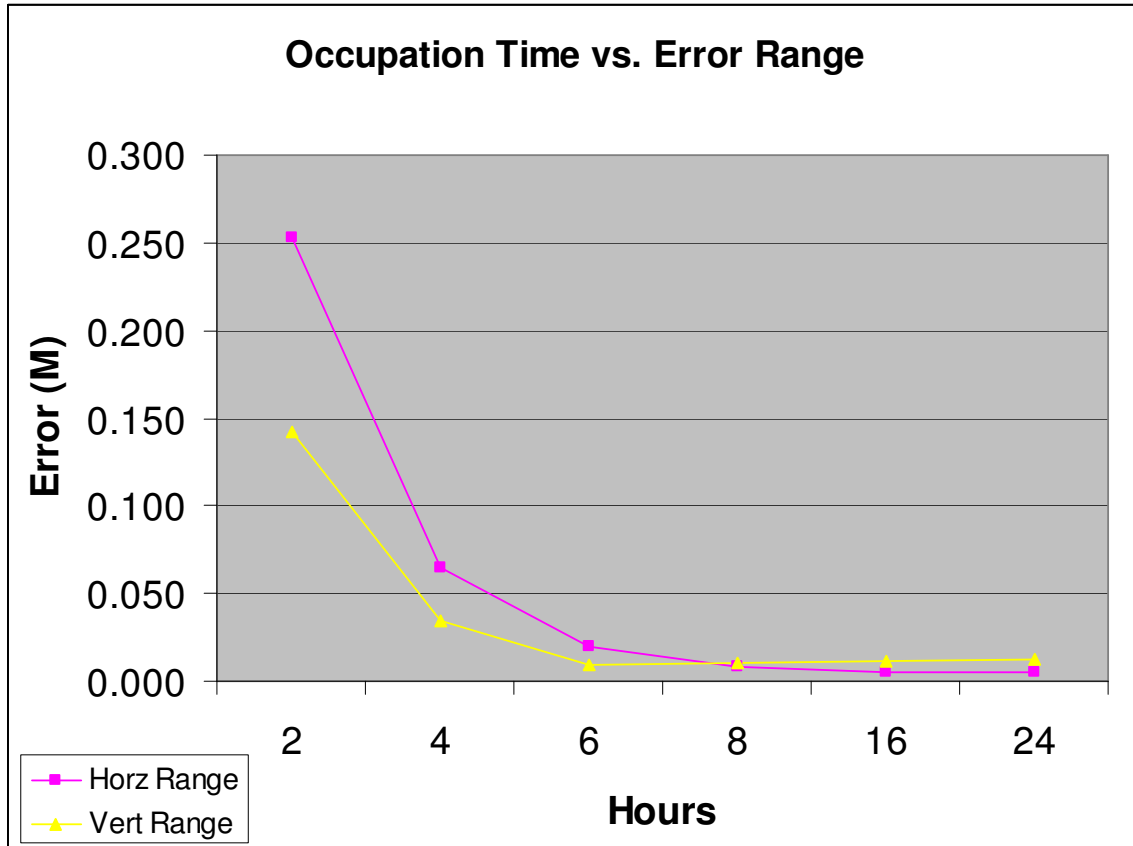
In addition, there is no nearby CORS, so OPUS is forced to process relatively long baselines for solutions. While this is not a worst-case scenario, it is certainly not a best-case test. Typically OPUS selects P105 in Delta Utah, MIDV in Midvale Utah and RBUT east of the University of Utah for vectors.

The OPUS solutions were tabulated and are presented below with a discussion of the results. It is important to note that anyone with an internet connection can easily duplicate this test for any day at (nearly) any NGS or UNAVCO CORS site in the United States.

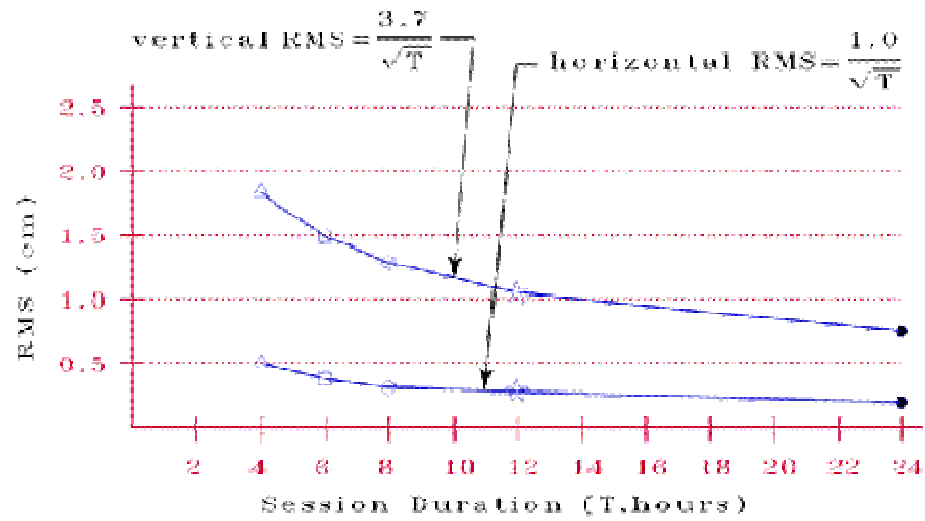
Results:

Full tabulated results are shown at the end of this document.

The following table summarizes the results:



This result mirrors the NGS published chart:



Of course for important elevation determination, much longer occupations may be in order.

Tabulated Results of OPUS Solutions

Comparing 2 Hour, 4 Hour, 8 Hour, 16 Hour and 24 Hour OPUS Solutions

All Data Collected at PUC1 on August 19, 2009

(Meters, Ellipsoid, NAD83-CORS96, UTC)

	X	Y	Z	dX	dY	dZ	dH	dV
True Position of PUC1								
PUC1-NGS-CORS	559370.140	2140762.385	1693.262					

Two Hour Observations

h2__200a.09o	559370.159	2140762.398	1693.293	0.019	0.013	0.031		
h2__200c.09o	559370.306	2140762.336	1693.354	0.166	-0.049	0.092		
h2__200e.09o	559370.067	2140762.419	1693.212	-0.073	0.034	-0.050		
h2__200g.09o	559370.135	2140762.386	1693.249	-0.005	0.001	-0.013		
h2__200i.09o	559370.144	2140762.376	1693.282	0.004	-0.009	0.020		
h2__200k.09o	559370.135	2140762.378	1693.302	-0.005	-0.007	0.040		
h2__200m.09o	559370.148	2140762.372	1693.259	0.008	-0.013	-0.003		
h2__200o.09o	559370.147	2140762.375	1693.277	0.007	-0.010	0.015		
h2__200q.09o	559370.141	2140762.390	1693.253	0.001	0.005	-0.009		
h2__200s.09o	559370.132	2140762.382	1693.271	-0.008	-0.003	0.009		
h2__200u.09o	559370.149	2140762.352	1693.268	0.009	-0.033	0.006		
h2__200w.09o	559370.173	2140762.359	1693.330	0.033	-0.026	0.068		
Avg	559370.153	2140762.377	1693.279	0.013	-0.008	0.017		
Min	559370.067	2140762.336	1693.212	-0.073	-0.049	-0.050		
Max	559370.306	2140762.419	1693.354	0.166	0.034	0.092		
Range	0.239	0.083	0.142	0.239	0.083	0.142	0.253	0.14

Four-Hour Observations

h4__200a.09o	559370.115	2140762.423	1693.256	-0.025	0.038	-0.006		
h4__200e.09o	559370.135	2140762.384	1693.260	-0.005	-0.001	-0.002		
h4__200i.09o	559370.139	2140762.379	1693.282	-0.001	-0.006	0.020		
h4__200m.09o	559370.141	2140762.382	1693.270	0.001	-0.003	0.008		
h4__200q.09o	559370.137	2140762.386	1693.271	-0.003	0.001	0.009		
h4__200u.09o	559370.153	2140762.370	1693.291	0.013	-0.015	0.029		
Avg	559370.137	2140762.387	1693.272	-0.003	0.002	0.010		
Min	559370.115	2140762.370	1693.256	-0.025	-0.015	-0.006		
Max	559370.153	2140762.423	1693.291	0.013	0.038	0.029		
Range	0.038	0.053	0.035	0.038	0.053	0.035	0.065	0.03

Six-Hour Observations

h6__200a.09o	559370.131	2140762.395	1693.273	-0.009	0.010	0.011		
h6__200g.09o	559370.139	2140762.379	1693.28	-0.001	-0.006	0.018		
h6__200m.09o	559370.141	2140762.384	1693.271	0.001	-0.001	0.009		
h6__200s.09o	559370.142	2140762.38	1693.275	0.002	-0.005	0.013		
Avg	559370.138	2140762.385	1693.275	-0.002	0.000	0.013		
Min	559370.131	2140762.379	1693.271	-0.009	-0.006	0.009		
Max	559370.142	2140762.395	1693.280	0.002	0.010	0.018		
Range	0.011	0.016	0.009	0.011	0.016	0.009	0.019	0.00

Eight-Hour Observations

h8__200a.09o	559370.135	2140762.380	1693.267	-0.005	-0.005	0.005		
h8__200i.09o	559370.139	2140762.382	1693.277	-0.001	-0.003	0.015		
h8__200q.09o	559370.142	2140762.377	1693.274	0.002	-0.008	0.012		
Avg	559370.139	2140762.380	1693.273	-0.001	-0.005	0.011		
Min	559370.135	2140762.377	1693.267	-0.005	-0.008	0.005		
Max	559370.142	2140762.382	1693.277	0.002	-0.003	0.015		
Range	0.007	0.005	0.010	0.007	0.005	0.010	0.009	0.01

Sixteen-Hour Observations

h16__200a.09o	559370.136	2140762.382	1693.273	-0.004	-0.003	0.011	0.005	0.01
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Twentyfour-Hour Observations

puc12000.09o	559370.139	2140762.380	1693.275	-0.001	-0.005	0.013	0.005	0.01
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