Auto-GIPSY, GrafNet, OPUS and SCOUT: A Comparison

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Presented here are results from three tests to determine GPS post-processing accuracy of static points in the continental USA. In each test, a geodetic quality dual frequency receiver was used. Six, twelve, and twenty-four occupation times were tested.

GrafNet (a multi-baseline static network-processing package by Waypoint Consulting Inc.) is compared with three free Internet services. The Internet services are as follows:

- Auto-GIPSY (http://milhouse.jpl.nasa.gov/ag/)
- OPUS (http://www.ngs.noaa.gov/OPUS/)
- SCOUT (http://sopac.ucsd.edu/cgi-bin/SCOUT.cgi)

The latter two services use a similar methodology, with one notable difference. Both OPUS and SCOUT will process a RINEX file provided by the user with the nearest three CORS/IGS stations. OPUS uses the nearest three CORS stations and SCOUT will use the nearest three IGS stations. This methodology is most common in GPS post processing as error sources such as ionospheric and tropospheric effects, satellite clock biases, and satellite orbital errors are strongly correlated with baseline length and their effects are either eliminated or minimized by differencing.

Solution quality will depend largely on the availability and proximity of base station data, and the availability of precise satellite orbits and clock corrections. As the IGS network is much denser than the CORS network, the average baseline length is typically (but not always) either the same or shorter for SCOUT solutions when compared to OPUS solutions.

Auto-GIPSY performs a single point solution, and is therefore not dependent on the proximity or availability of CORS/IGS data. One limitation to this service is that it currently does not process data unless final precise orbits (as opposed to rapid or ultra-rapid) orbits and clock corrections are available. These typically become available about two weeks after data collection. The results are as follows:

Horizontal RMS Errors (cm)				
	6 hours	12 hours	24 hours	Average
GIPSY	2.65	2.04	2.64	2.44
GrafNet	1.77	1.11	1.18	1.35
OPUS	1.2	1.56	1.49	1.42
SCOUT	1.06	1.23	1.25	1.18

Vertical RMS Errors (cm)				
	6 hours	12 hours	24 hours	Average
GIPSY	2.47	1.93	3.48	2.63
GrafNet	1.86	2.07	2.36	2.10
OPUS	3.73	3.55	4.00	3.76
SCOUT	1.03	0.96	0.91	0.97

On average, SCOUT was found to produce the best horizontal and vertical accuracies, followed by GrafNet. OPUS performed better than GIPSY in the horizontal component, however GIPSY out-performed OPUS in the vertical component.

The data from each test is presented below:

Results for Station FOOT

6 Hour Processing Results: FOOT				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.3	0.49	0.03	0.09
Δ Longitude (cm)	2.53	0.97	0.81	0.69
Δ Height (cm)	3	0.44	2.3	0.9
Horizontal Error (cm)	2.55	1.09	0.81	0.7

12 Hour Processing Results: FOOT				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.3	0.58	0.27	0
Δ Longitude (cm)	1.84	0.45	0.64	1.15
Δ Height (cm)	2.3	0.16	2.7	0.27
Horizontal Error (cm)	1.86	0.73	0.69	1.15

24 Hour Processing Results: FOOT				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.3	0.04	0.37	0
Δ Longitude (cm)	0.69	0.34	0.58	1.2
Δ Height (cm)	3.9	0.49	2.4	0.27
Horizontal Error (cm)	0.75	0.34	0.69	1.2

Results for Stations TUNG:

6 Hour Processing Results: TUNG				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.9	0.01	0.24	0.3
Δ Longitude (cm)	2.07	0.19	0.74	0.25
Δ Height (cm)	2.9	3.13	5.9	0.02
Horizontal Error (cm)	2.26	0.19	0.78	0.39

12 Hour Processing Results: TUNG				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.9	0.63	0.06	0.3
Δ Longitude (cm)	1.38	0.44	0.62	0.23
Δ Height (cm)	2.1	3.58	5.5	1.04
Horizontal Error (cm)	1.65	0.77	0.62	0.38

24 Hour Processing Results: TUNG				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	0.6	0.5	0.09	0.3
Δ Longitude (cm)	0.46	0.29	0.74	0.23
Δ Height (cm)	4.3	4.06	6.5	0.34
Horizontal Error (cm)	0.76	0.58	0.75	0.38

Results for Station CHZZ:

6 Hour Processing Results: CHZZ				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	3	2.48	1.5	1.38
Δ Longitude (cm)	0.69	1.4	0.92	0.92
Δ Height (cm)	0.1	0.65	1.27	1.54
Horizontal Error (cm)	3.08	2.85	1.76	1.66

12 Hour Processing Results: CHZZ				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	2.1	0.97	2.13	1.5
Δ Longitude (cm)	1.38	1.28	1.38	0.92
Δ Height (cm)	1.2	0.14	0.6	1.27
Horizontal Error (cm)	2.51	1.61	2.54	1.76

24 Hour Processing Results: CHZZ				
	GIPSY	GrafNet	OPUS	SCOUT
Δ Latitude (cm)	1.8	1.45	2.01	1.5
Δ Longitude (cm)	1.61	1.27	1.27	0.92
Δ Height (cm)	1.6	0.14	0.1	1.52
Horizontal Error (cm)	2.41	1.93	2.38	1.76