





### General Guidelines

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Review antenna type and height

Review statistics:

- at least 90% of observations should be used
- at least 50% of the ambiguities should be fixed
- overall RMS should seldom exceed 0.030 m



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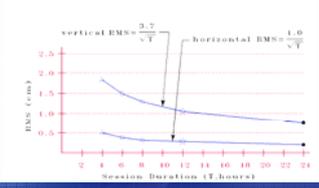
### How Can I Improve My Results?

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Consider observing a longer session

Data sets of at least four hours have been shown to produce more reliable results

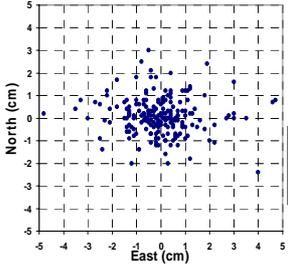
Avoid conditions that perturb the GPS signal—unsettled weather, solar flares, multipath (nearby reflective surfaces)




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### Distribution of Horizontal Offset from Accepted Values

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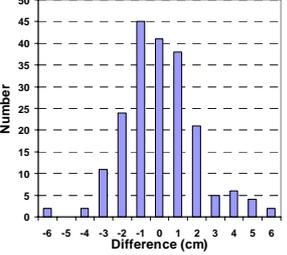
- > 200 CORS
- 2 hours of data
- 0.8 cm N-S RMS
- 1.4 cm E-W RMS



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### Distribution of Vertical Offset from Accepted Values

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- > 200 CORS
- 2 hours of data
- 1.9 cm RMS
- All mean offsets < 1 mm



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### Recent Solutions

Day of Year = 2

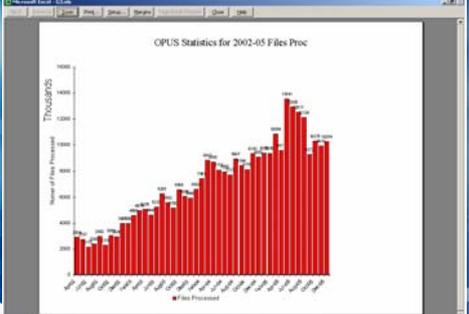
Yellow triangle represents latest solution.




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### Files processed during even-numbered months, 2002-2005

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### OPUS Extended Output: Observations summary

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ORIG BY SATELLITE VS. BASELINE

	OVERALL	01	04	11	13	14	16	20	23
corrx-corrz	248	24	25	25	24	24	24	24	23
corry-corrz	24	24	24	24	24	24	24	24	23
OVERALL	01	04	11	13	14	16	20	23	
chzx-corrz	1260	128	65	149	125	...	117	...	238
chzy-corrz	24	25	25	24	24	...	24	...	23
p376-corrz	1486	239	67	156	129	35	163	...	238
p376-corrz	24	25	25	24	24	...	24	...	23

Each baseline has a summary of the observations received from each satellite.

OBS USED: 4228 / 4314 : 98%

As discussed on slides 14 & 15 (Reading OPUS output, Guidelines for Good Solution), the Standard Output summarizes the total percent of observations used over all three baselines.

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### OPUS Extended Output: Covariance Matrices

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Additional statistics developed by PAGES for use in commercial adjustment software:

Diagonal elements:  
 Variance of x: 0.0000024956  
 Variance of y: 0.0000038978  
 Variance of z: 0.0000080578

Off-diagonal elements:  
 Covariance of x-y: 0.000002586  
 Covariance of x-z: -0.000003699  
 Covariance of y-z: -0.000004229

Estimates of network accuracy. These may be too optimistic, given that peak-peak errors are in the 1-3 cm range.

Covariance Matrix for the xyz OPUS Position (meters<sup>2</sup>):  
 0.0000024956    0.000002586    -0.000003699  
 0.000002586    0.0000038978    -0.000004229  
 -0.000003699    -0.000004229    0.0000080578

Covariance Matrix for the emu OPUS Position (meters<sup>2</sup>):  
 0.0000026809    -0.000004333    0.0000033326  
 -0.000004333    0.0000053747    0.0000021840  
 0.0000033326    0.0000021840    0.0000083955

Horizontal network accuracy = 0.00500 meters.  
 Vertical network accuracy = 0.00496 meters.

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### OPUS Extended Output: NAD 83 quantities

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Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(CORS96) (EPOCH:2002.0000):

	Xa(m)	Ya(m)	Za(m)
NEKP	-2548453.26133	-3769451.88039	4454637.42077
CHZZ	-2503335.82617	-3714408.62715	4525454.72998
P376	-2469806.16816	-3788349.79220	4482853.31622

Position of reference station monument in NAD\_83(CORS96) (EPOCH:2002.0000):

	Xa(m)	Ya(m)	Za(m)
NEKP	-2548453.39333	-3769450.84019	4454636.42117
CHZZ	-2503335.79517	-3714408.58125	4525454.67368
P376	-2469806.16496	-3788349.18730	4482853.31032

Velocity of reference station monument in NAD\_83(CORS96) (EPOCH:2002.0000):

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
NEKP	0.01180	0.00240	0.00600
CHZZ	0.00550	-0.00410	0.00200
P376	0.00460	0.00380	0.00560

Vectors from unknown station monument to reference station monument in NAD\_83(CORS96) (EPOCH:2002.0000):

	Xz-Xa (m)	Yz-Ya (m)	Zz-Za (m)
NEKP	-50030.20233	33371.21181	-101.27783
CHZZ	-4912.62717	88413.47075	70716.97468
P376	28617.00304	14472.26470	28115.61132

The above quantities are derived by transformation from similar ITRF quantities.

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### OPUS Extended Output: SPC—Disclaimer--End

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STATE PLANE COORDINATES - International Foot

	SPC (361)	OR (1)
Starting (X) (feet)	343676.7298	
Starting (Y) (feet)	7471575.7485	
Convergence (degrees)	-1.38897497	
Scale Factor	0.99999692	
Combined Factor	0.99999298	

This baseline and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

State Plane Coordinate quantities  
 Disclaimer

End of OPUS Extended Output.  
 Next: example of adjusting several sessions submitted to OPUS for the same station

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### References

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Coordinate Systems  
 A series of four papers about Terrestrial Reference Systems  
 Snay, R.A. & T. Soler (1999). Part 1 - Modern Terrestrial Reference Systems. *Professional Surveyor*, 19(10), 32-33.  
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Questions / Comments



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