GGOS Network Simulation Studies

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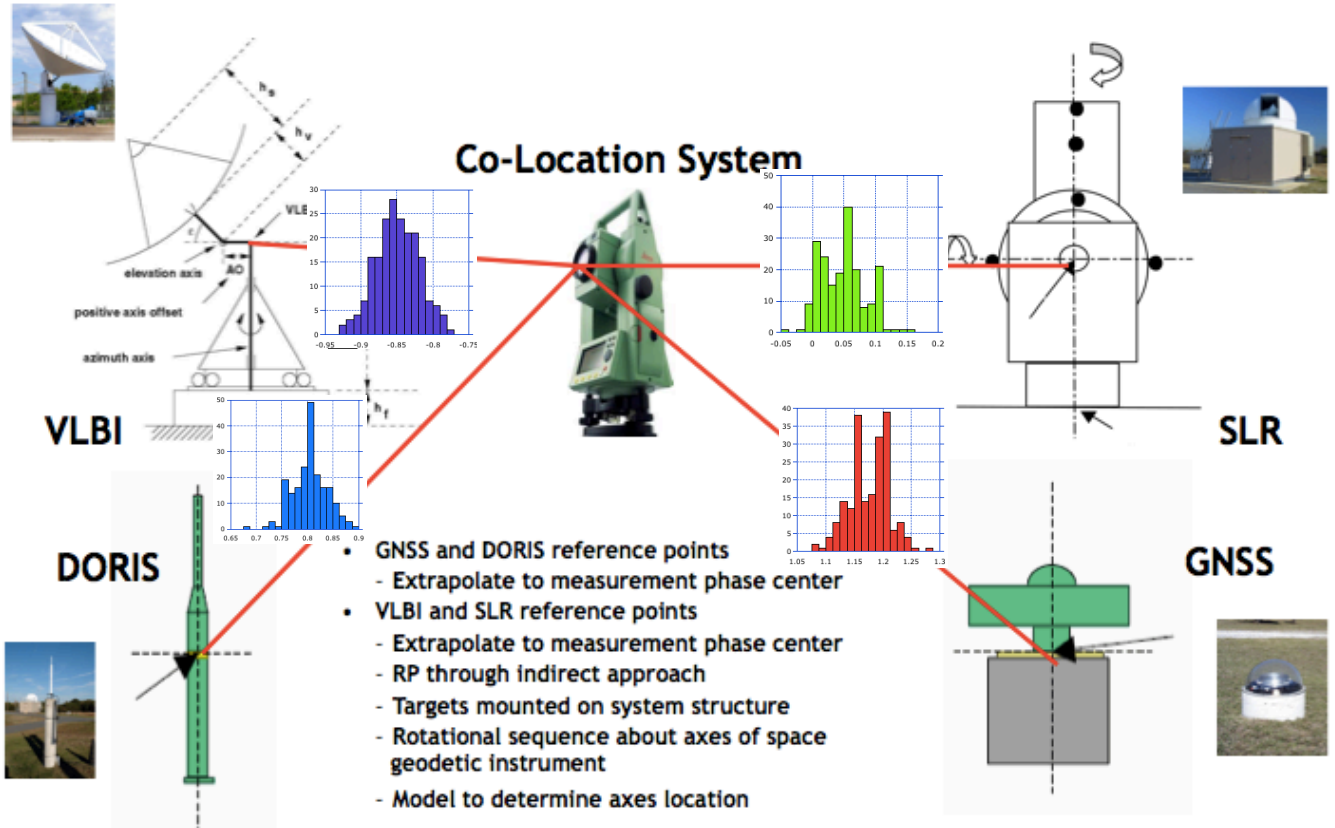
Schedule and Progress

- Simulation of a GRASP mission with SLR+VLBI+GPS+DORIS is underway
- Current work focused on assessing the level of error contribution in the ITRF origin and scale from the errors in the site ties of each site using 200 realizations of the errors at each site (Monte Carlo approach)
  - Four levels of (3D) error looked at are: 0.5, 1.0, 2.5 and 5.0 mm
  - Four classes of stations will be examined:
    - Single technique (DONE), results discussed in San Francisco, CA
    - 4-technique (DONE), presented at EGU 2012 (Thursday afternoon poster: G2.1 XL69)
    - 3-technique and 2-technique (in progress)

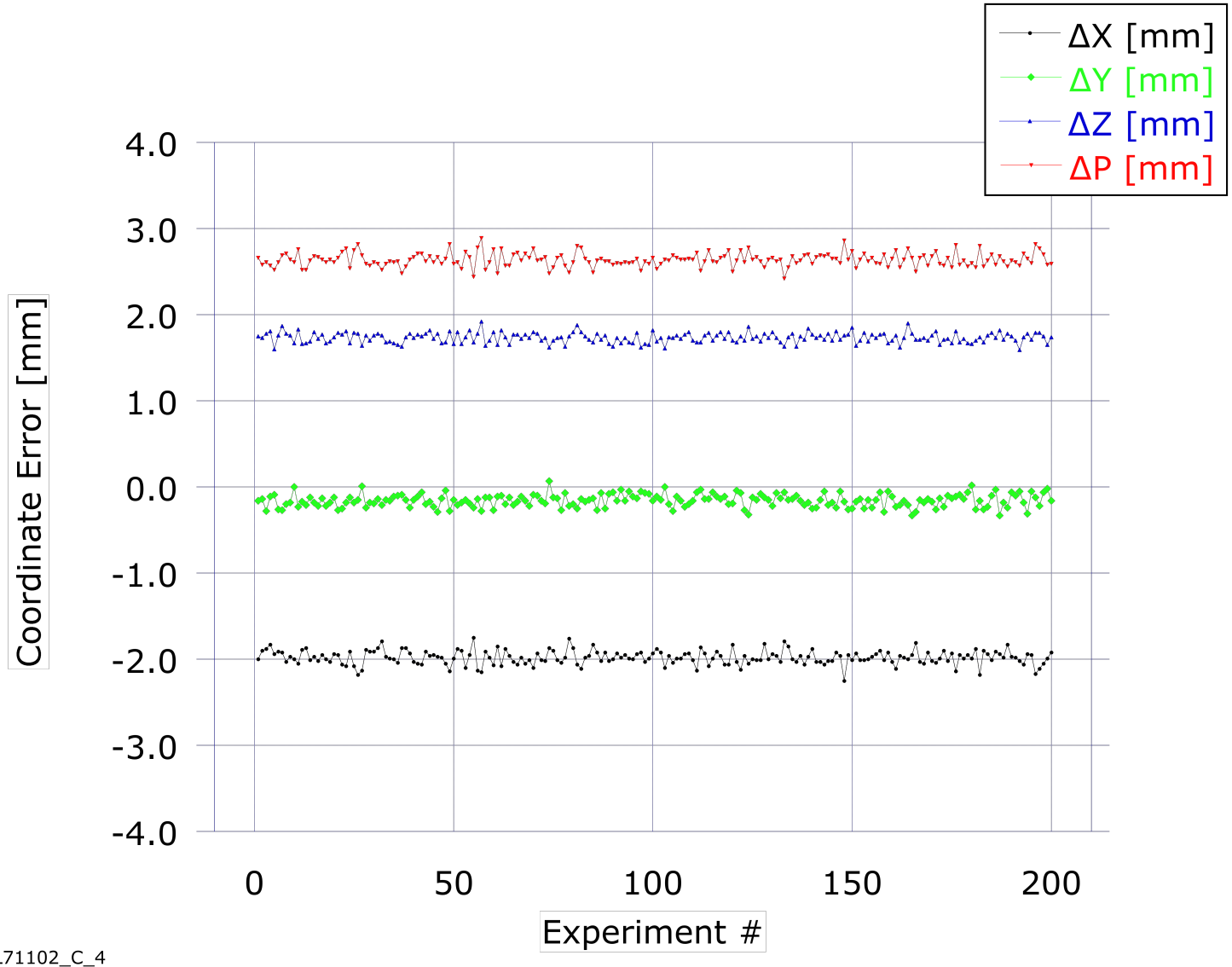
Site Tie Error Simulation

CONVENTIONAL INTER-TECHNIQUE SURVEY TIES



- GNSS and DORIS reference points
  - Extrapolate to measurement phase center
- VLBI and SLR reference points
  - Extrapolate to measurement phase center
  - RP through indirect approach
  - Targets mounted on system structure
  - Rotational sequence about axes of space geodetic instrument
  - Model to determine axes location

Site Tie Error Simulation



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TRF Error Statistics [mm, ppb, mas]

Case A (0.5 mm) 4-techniques

Component	Mean	Std. Dev.	RMS	Mean σ	Std. Dev. σ	RMS σ
T_X	0.0189	0.0168	0.0253	0.0774	0.0019	0.0774
T_Y	0.1512	0.0113	0.1516	0.0773	0.0019	0.0773
T_Z	0.0936	0.0264	0.0973	0.0769	0.0019	0.0769
D_S	0.0593	0.0024	0.0594	0.0120	0.0003	0.0121
R_X	0.0024	0.0008	0.0026	0.0000	0.0031	0.0031
R_Y	0.0017	0.0008	0.0019	0.0031	0.0001	0.0031
R_Z	-0.0079	0.0006	0.0079	0.0030	0.0001	0.0030

TRF Error Statistics [mm, ppb, mas]

Case B (1.0 mm) 4-techniques

Component	Mean	Std. Dev.	RMS	Mean σ	Std. Dev.σ	RMS σ
T_X	0.0069	0.0183	0.0195	0.0806	0.0023	0.0806
T_Y	0.0536	0.0244	0.0589	0.0805	0.0023	0.0805
T_Z	-0.4020	0.0304	0.4032	0.0801	0.0022	0.0801
D_S	-0.1244	0.0041	0.1244	0.0126	0.0004	0.0126
R_X	-0.0020	0.0010	0.0022	0.0000	0.0032	0.0032
R_Y	0.0066	0.0011	0.0067	0.0032	0.0001	0.0032
R_Z	0.0305	0.0008	0.0305	0.0031	0.0001	0.0031

TRF Error Statistics [mm, ppb, mas]

Case C (2.5 mm) 4-techniques

Component	Mean	Std. Dev.	RMS	Mean σ	Std. Dev.σ	RMS σ
T_X	-0.0832	0.0396	0.0922	0.1062	0.0039	0.1063
T_Y	0.0169	0.0465	0.0495	0.1061	0.0039	0.1062
T_Z	0.7872	0.0359	0.7880	0.1056	0.0039	0.1056
D_S	0.2629	0.0061	0.2630	0.0165	0.0006	0.0166
R_X	0.0033	0.0017	0.0037	0.0000	0.0042	0.0042
R_Y	-0.0025	0.0014	0.0028	0.0042	0.0002	0.0042
R_Z	-0.0606	0.0017	0.0606	0.0041	0.0002	0.0041

Summary

- Analysis of the simulated TRF realizations with three levels of errors (0.5, 1.0, 2.5, and 5.0 mm) and the assumption of four techniques present at all 32 sites indicates:
  - 0.5 mm is too strict of a requirement (overkill)
  - 1.0 mm meets requirements
  - 2.5 mm is marginally acceptable (reality will be probably worse)
- Next set of simulations will investigate the cases where less than four techniques are present at each site and a reasonable number of networks with mixed cases of both parameters, i.e. level of site tie errors and number of techniques present

Schedule - Milestones

Planned	Status	Status/Description
Apr. 2012	In progress	Quantify the impact of errors in vector ties between different observing systems at each station
May 2012		Investigate tradeoff scenarios for incomplete deployments (sites with some tech. already avail.)
June 2012		Investigate tradeoffs of using existing versus new sites
Aug. 2012		Understand the impact of likely phased deployment of new stations
Dec. 2012		Data analysis and validation
July 2013		Data combination and evaluation of ITRF product
Dec. 2013		SGP Integration support