



GeoEye Geolocation Assessment and Reporting Update for 2011

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JACIE Workshop

Geolocation Report for 2011

- › **GeoEye-1 Geolocation accuracy performance**
 - Absolute Monoscopic and Stereoscopic Geolocation
- › **IKONOS Geolocation accuracy performance**
 - Absolute Monoscopic Geolocation
- › **GeoEye-2**
 - Status
 - Estimated geolocation accuracy performance

GE-1 Geolocation Accuracy Test Results

Period	Mono			Stereo				
	# images	CE90 (m)	RMSE (m)	# pairs	CE90 (m)	RMSE (m)	LE90 (m)	RMSE (m)
2009 Q2-Q4	530	3.6	2.3	222	3.4	2.2	3.2	2.0
2010	136	3.8	2.4	65	3.5	2.2	3.5	2.3
2011	193	2.8	1.9	43	2.8	1.9	2.9	1.8

- › **Based on rigorous (physical) model**
- › **Direct positioning**
 - No adjustment of imagery
- › **Typical collection geometry was up to 30 degrees off nadir angle and stereo convergence angle of 45 degrees**

GE-1 Absolute Mono Geolocation Accuracy for 2011

CE90 = 2.8 meters

RMSE = 1.9 meters

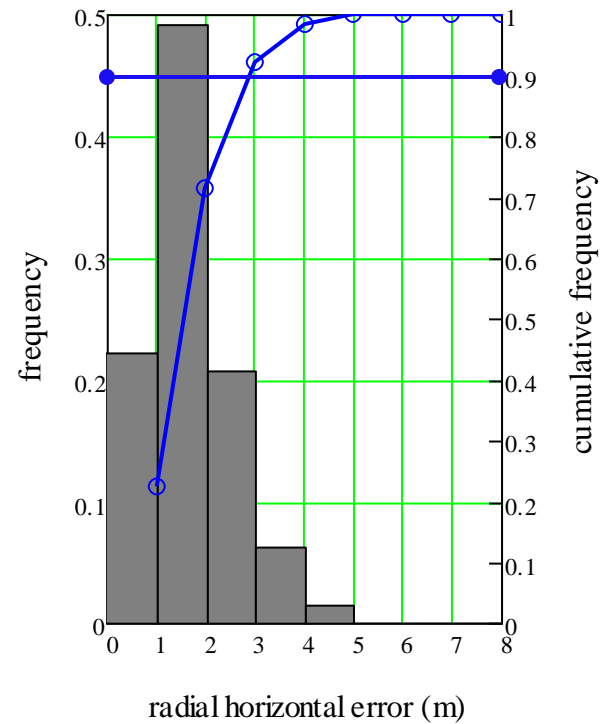
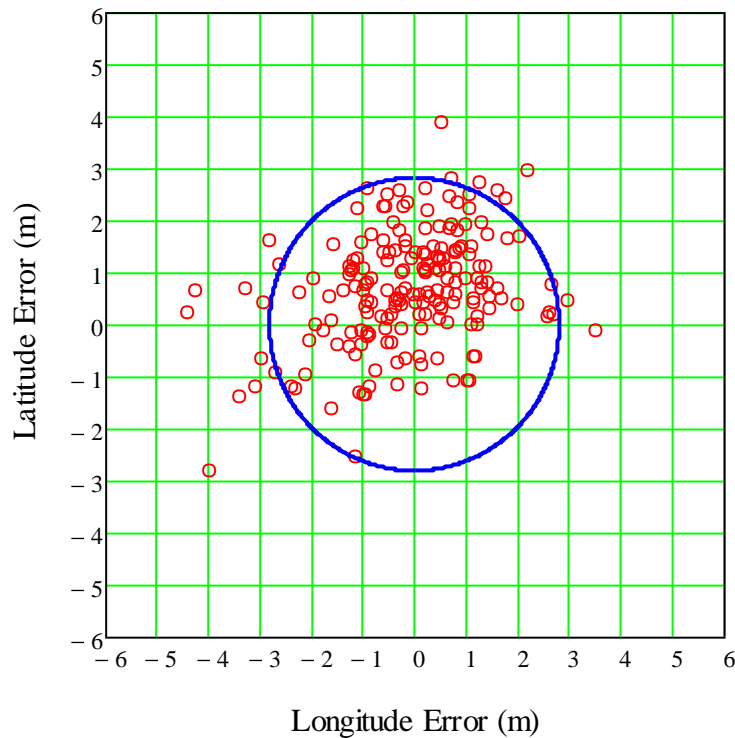
n = 193

mean($\Delta\phi$) = 0.7m

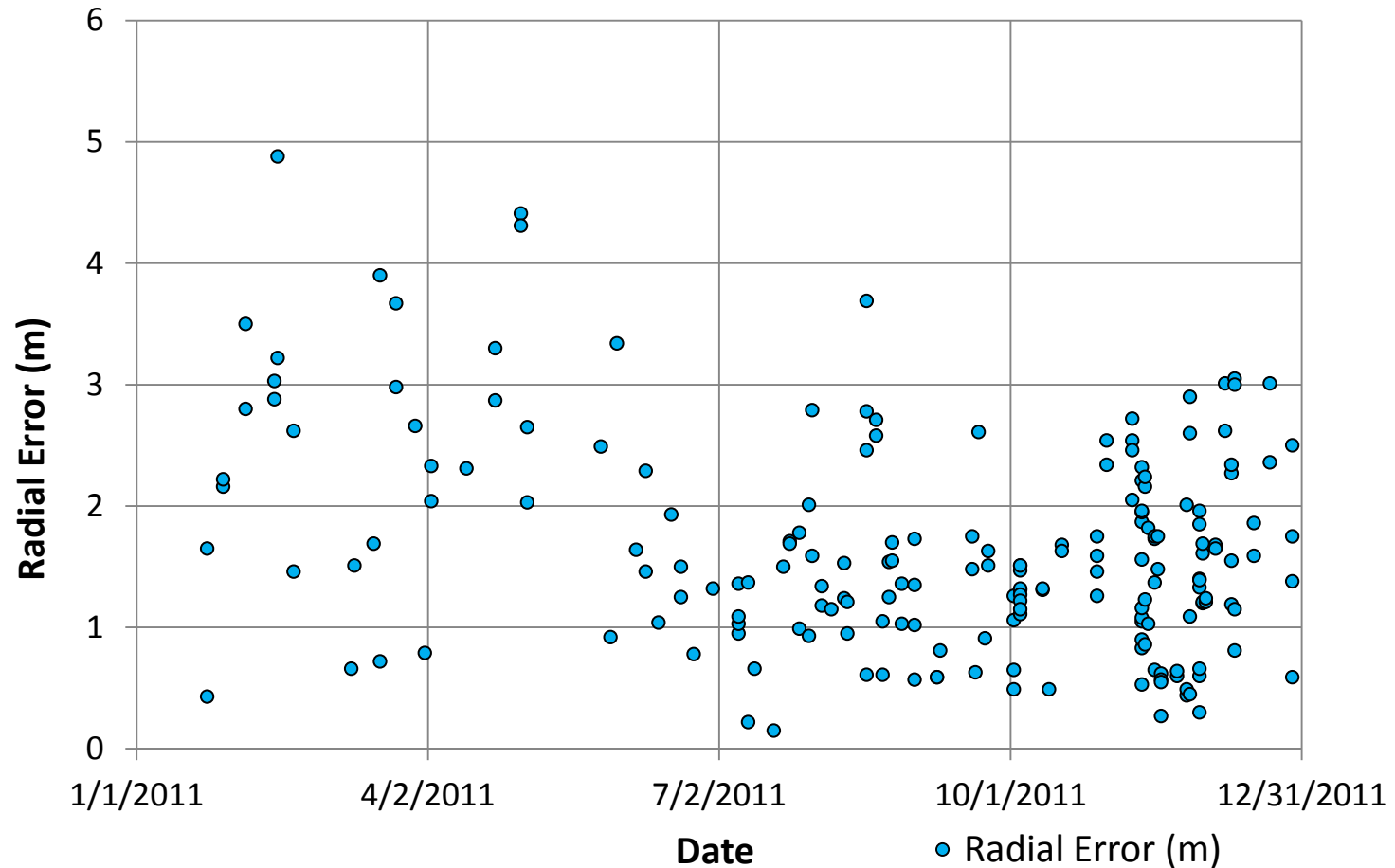
mean($\Delta\lambda$) = -0.1m

stdev($\Delta\phi$) = 1.1m

stdev($\Delta\lambda$) = 1.3m



Time Series of GE-1 Mono Geolocation for 2011



GE-1 Absolute Stereo Geolocation Accuracy for 2011

CE90 = 2.8 meters

RMSE = 1.9 meters

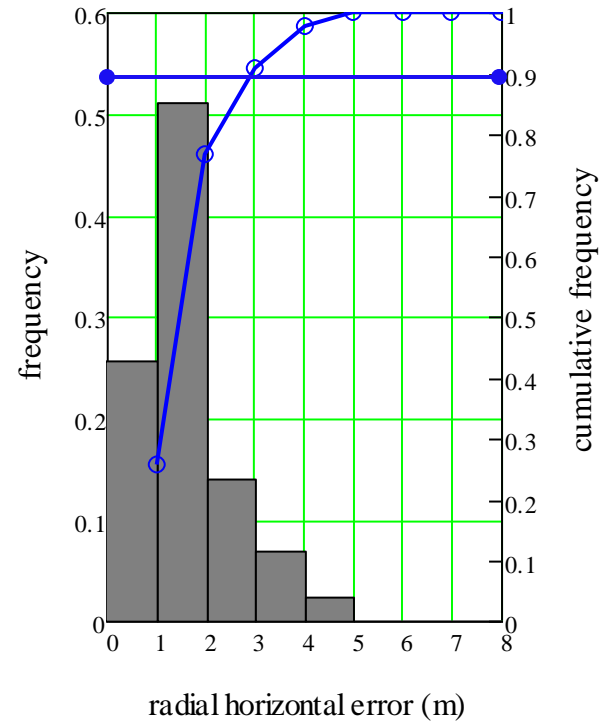
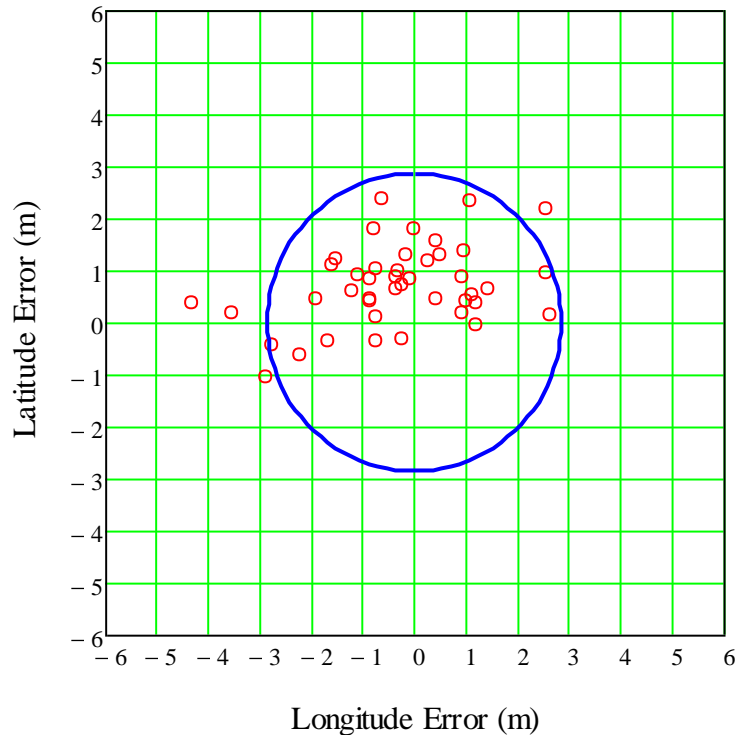
n = 43

mean($\Delta\phi$) = 0.7m

mean($\Delta\lambda$) = -0.3m

st dev ($\Delta\phi$) = 0.8m

st dev ($\Delta\lambda$) = 1.5m



GE-1 Absolute Stereo Geolocation Accuracy for 2011

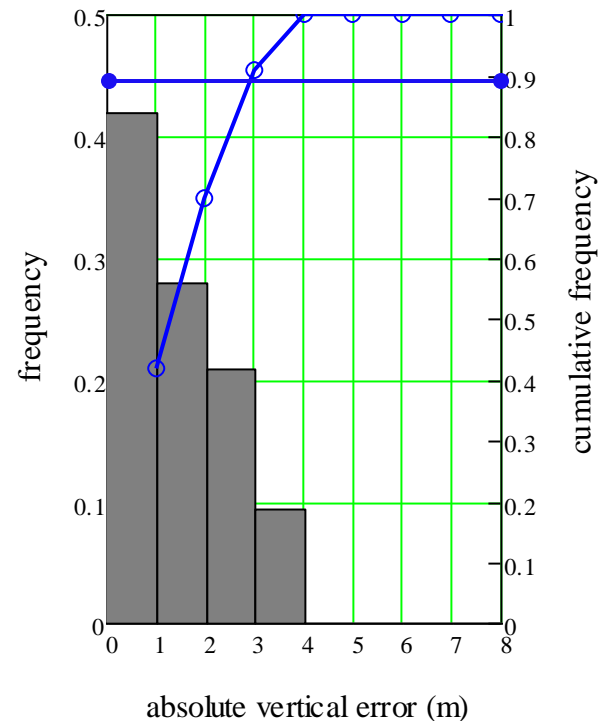
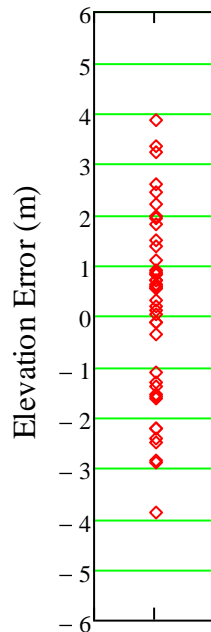
LE90 = 2.9 meters

RMSE = 1.8 meters

$n = 43$

$\text{mean}(\Delta h) = 0.2\text{m}$

$\text{stdev}(\Delta h) = 1.8\text{m}$



IKONOS Metric Accuracy & Stability

Absolute Accuracy

- How close the points are to zero error.

Relative Accuracy

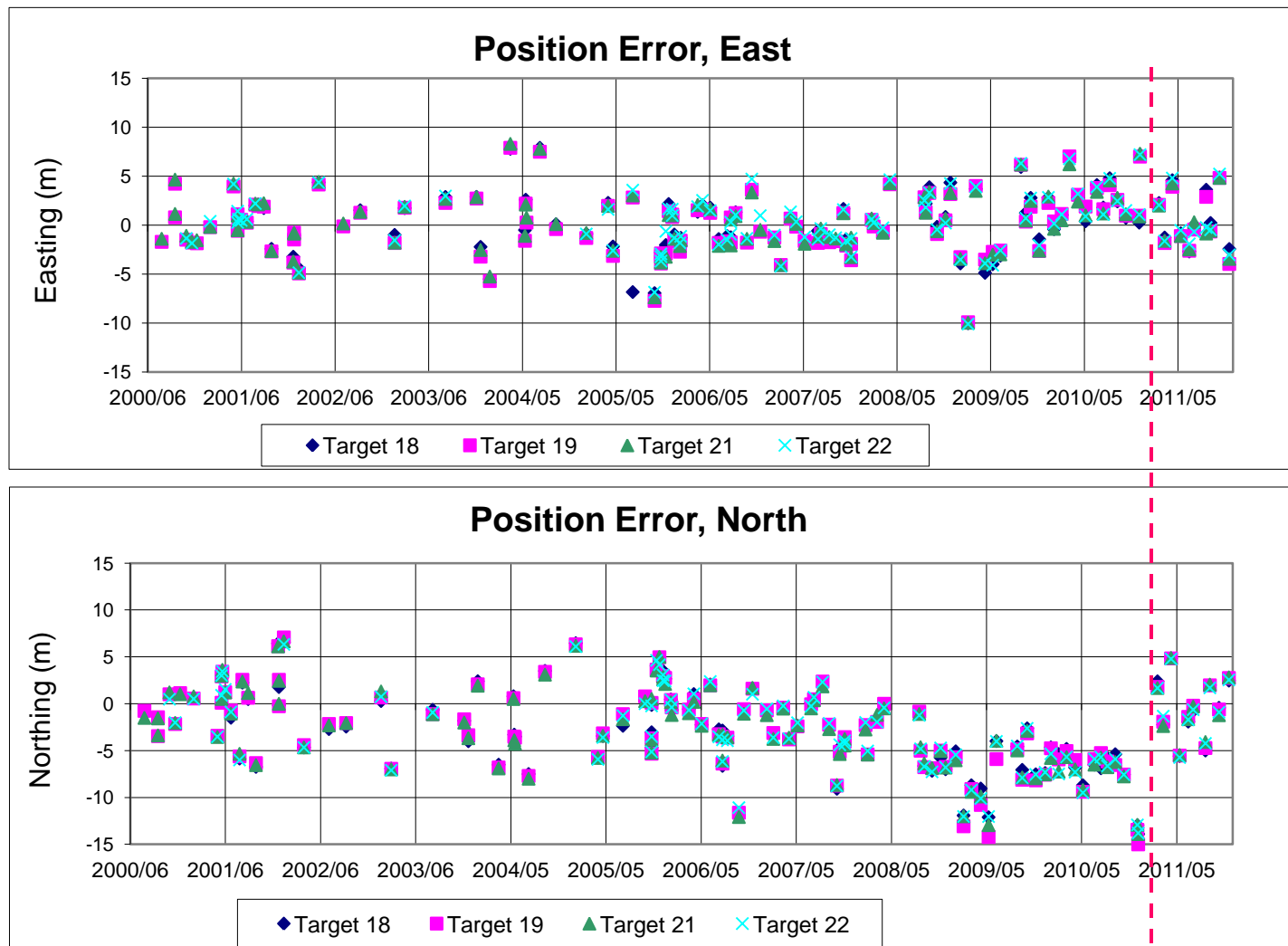
- How close the points on a given day are to each other.

Stability

- Consistency from year to year.

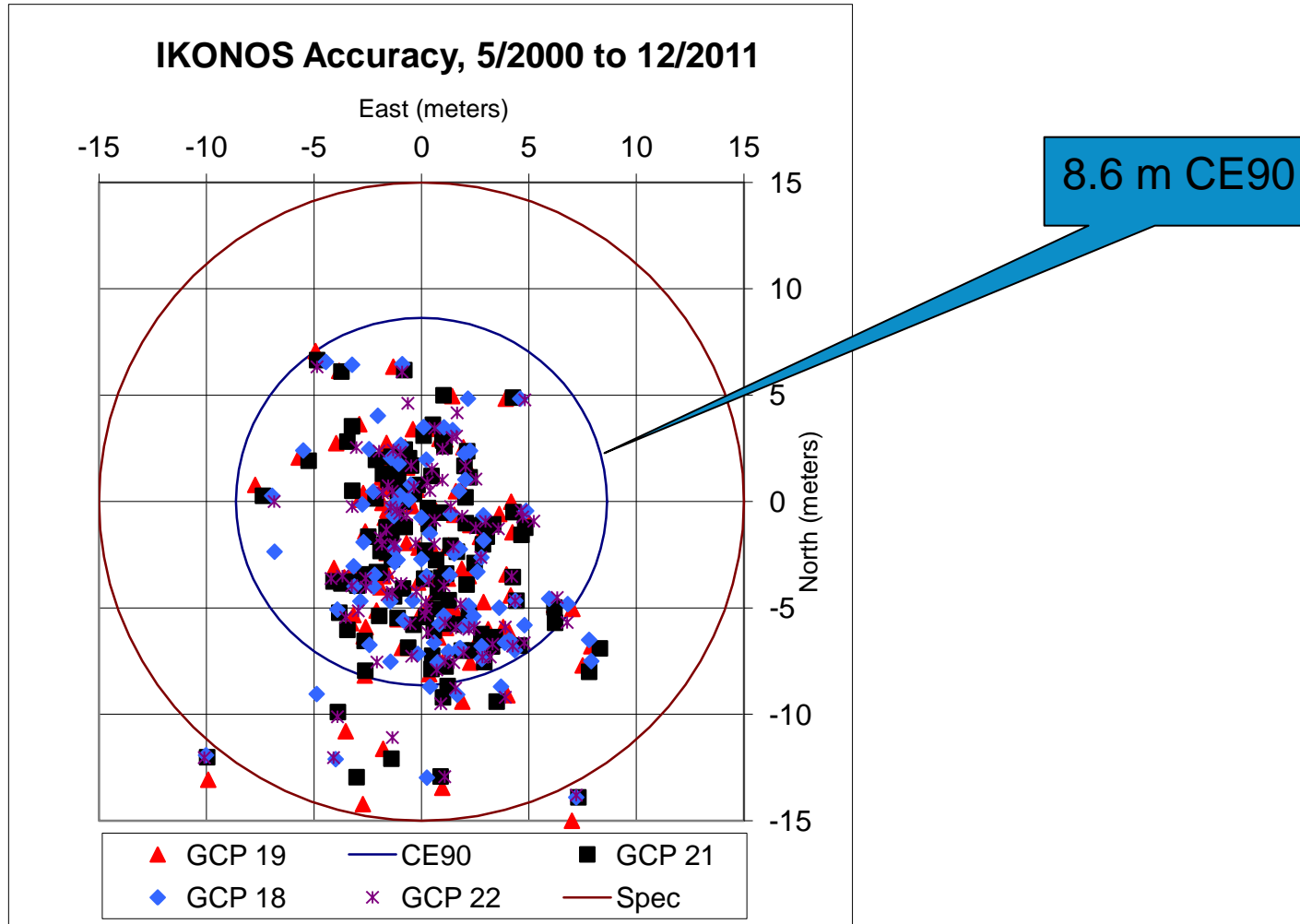
Mission Accuracy

- 8.6 m CE90



Interlock Adjusted
2011-03-14

IKONOS Accuracy, IOC to 2011



GeoEye-2 Geolocation Status

› **System CDR was in Jan 2012**

› **Flight Software**

- Onboard attitude filter-smoother
- Ancillary data telemetry under ICD

› **Camera has been delivered**

- As-built optical distortion and focal plane detector locations

› **GE-2 photogrammetric calibration model status**

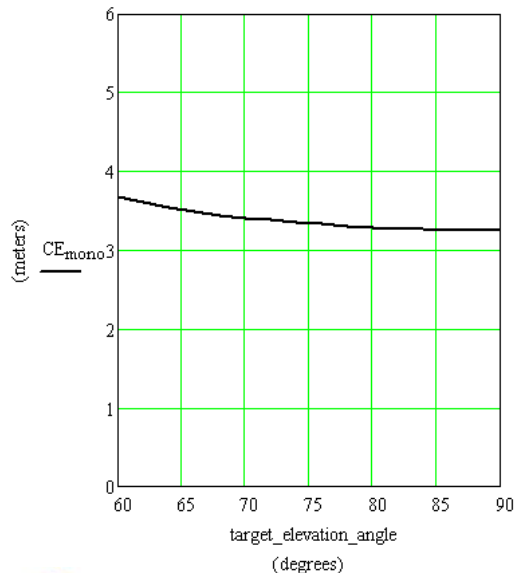
- Similarity to GE-1 allows reuse of photogrammetric calibration model
 - Some model differences due to system timing
- The pre-launch FAM (Field Angle Map) for the photogrammetric calibration model is being determined
- Interlock angles, GPS antenna offsets, center of mass, etc from design

GE-2 Estimated Geolocation Accuracy

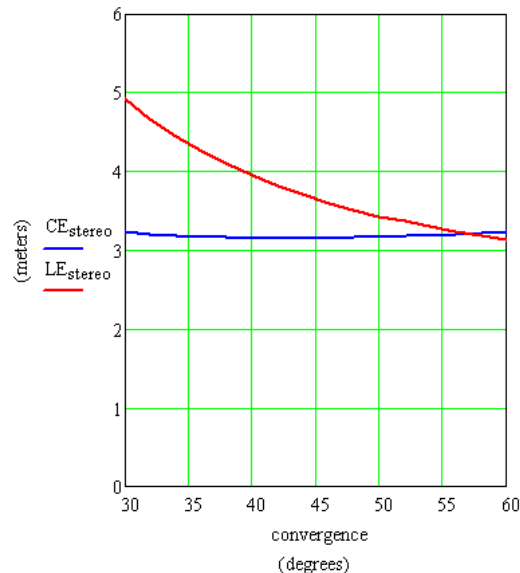
› Estimates based on the System Critical Design Review

- Random error propagation based on Gaussian distributions
 - Mono at target elevation angle of 60°: CE90 = 3.7m
 - Stereo at convergence angle of 45°: CE90/LE90 = 3.2m/3.7m
 - Estimated performance will updated after the star trackers are delivered

GE-2 Geolocation Error Estimate Mono



GE-2 Geolocation Error Estimate Stereo



Showing estimated performance over a range of collection geometries

Spec performance is 5 meters for mono CE90 and stereo CE90/LE90

Questions