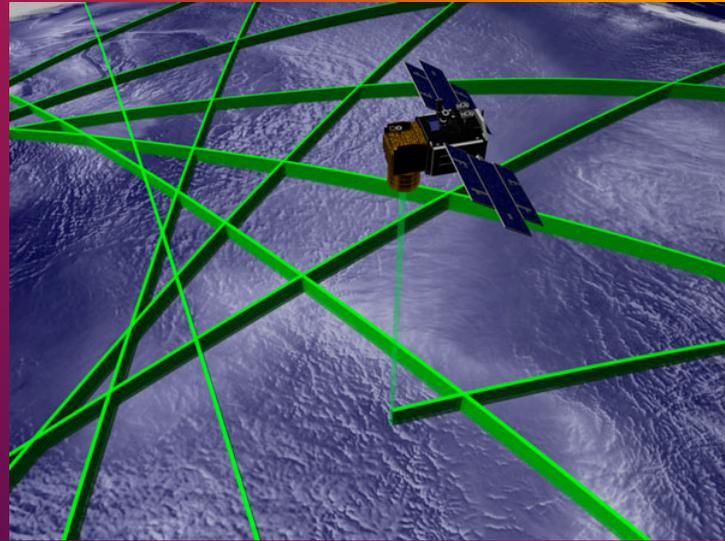


Assessment of ICESat Reference Ground-Track Targeting

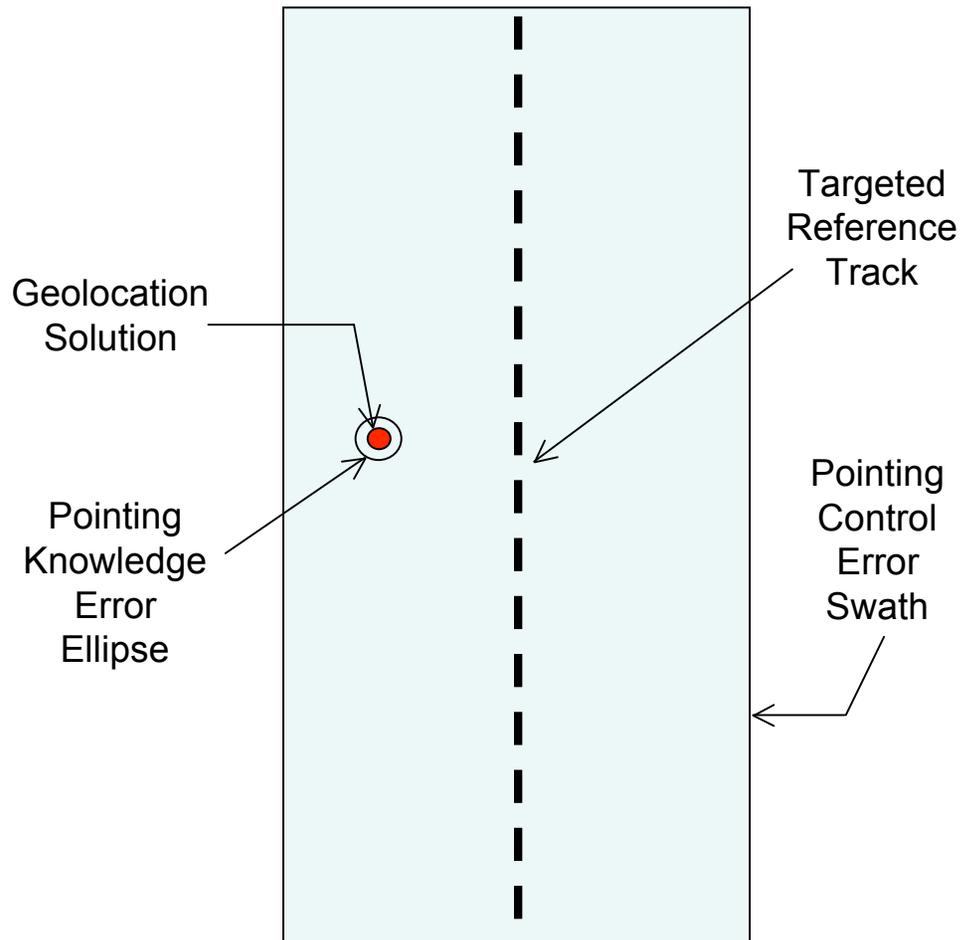
Charles E. Webb
Bob E. Schutz

Center for Space Research
University of Texas at Austin

ICESat Science Team Meeting
Buffalo, New York
Sept 30 – Oct 2, 2008

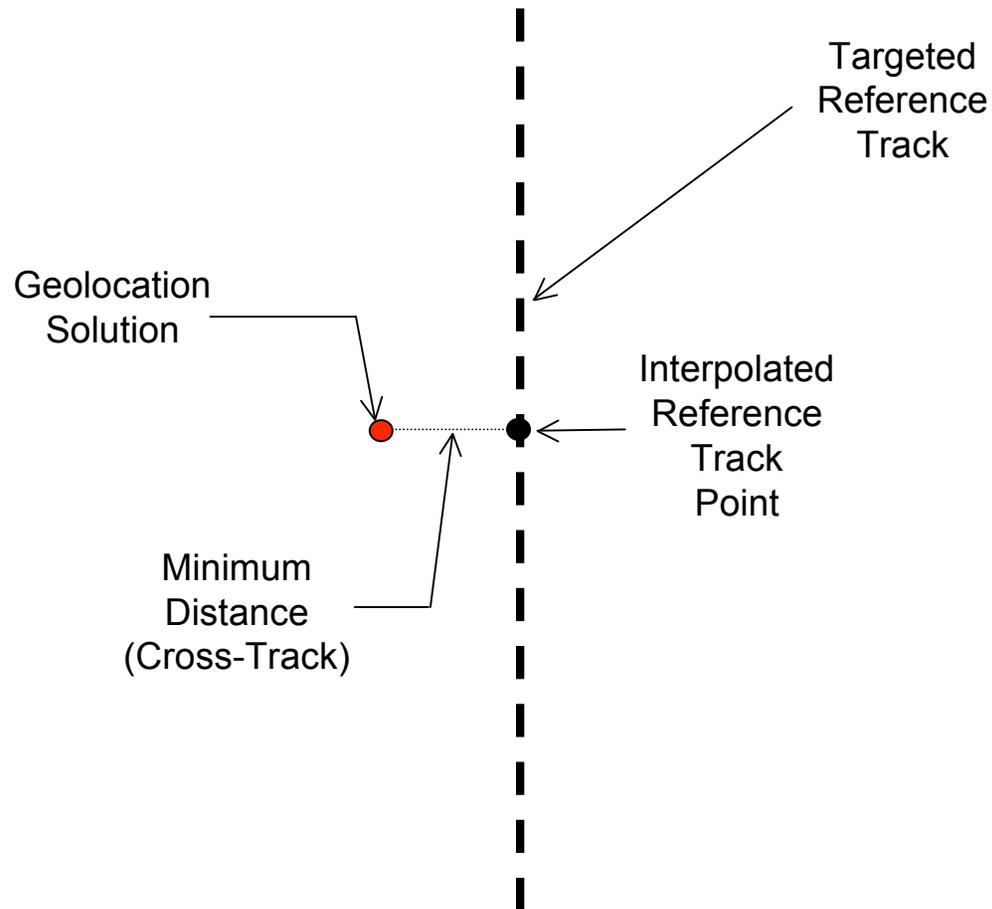


Pointing Control Errors



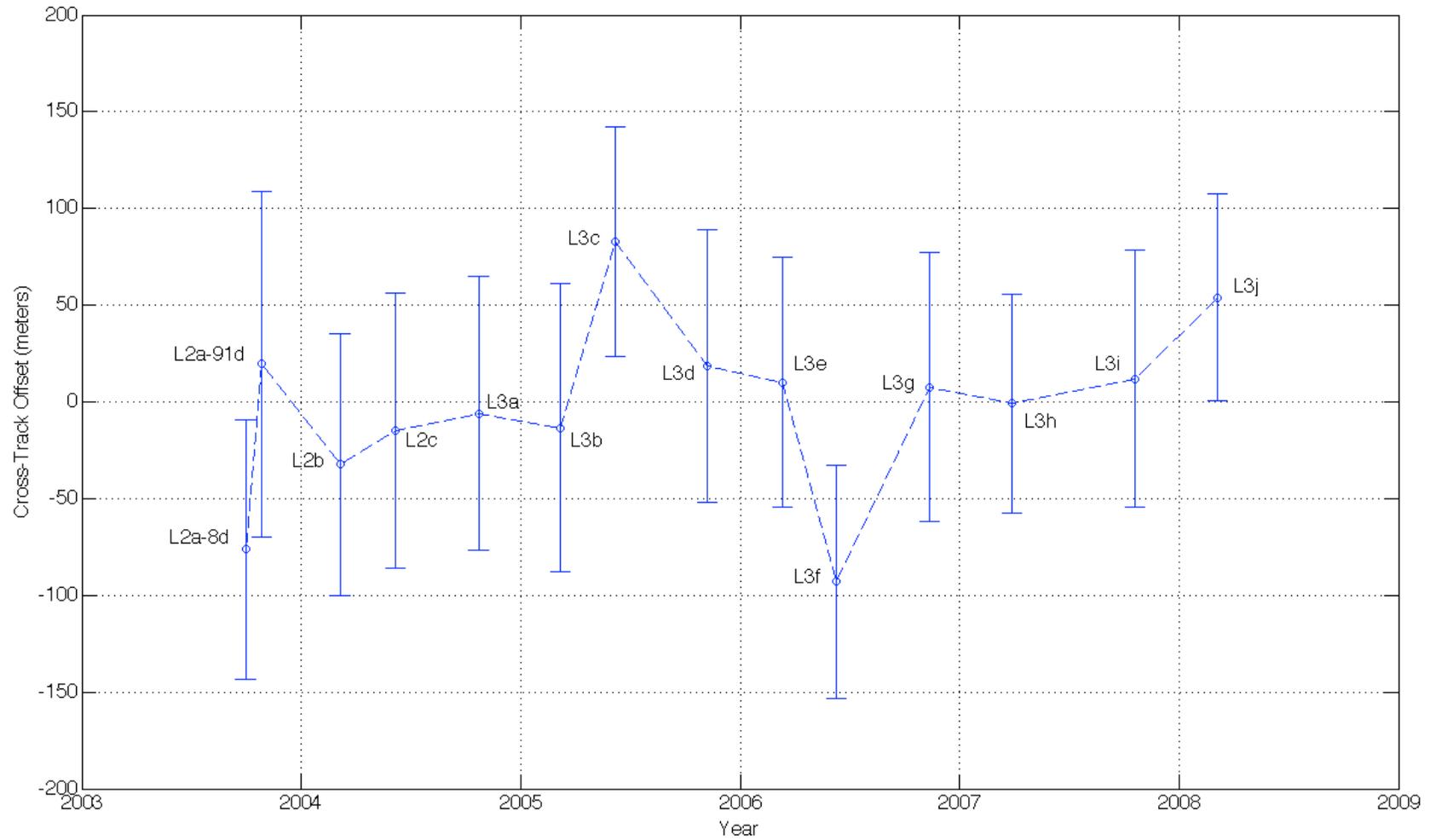
- Reference ground tracks generated at 1-Hz by CSR
- Straight-line approximations at 2-min intervals yield target attitudes, body rates uploaded daily by LASP
- Prior to launch, analyses showed error swath driven by on-board attitude control errors, orbit prediction errors, and **jitter**
- Since launch, have learned a significant additional component is laser offset from satellite nadir axis

Cross-Track Offset

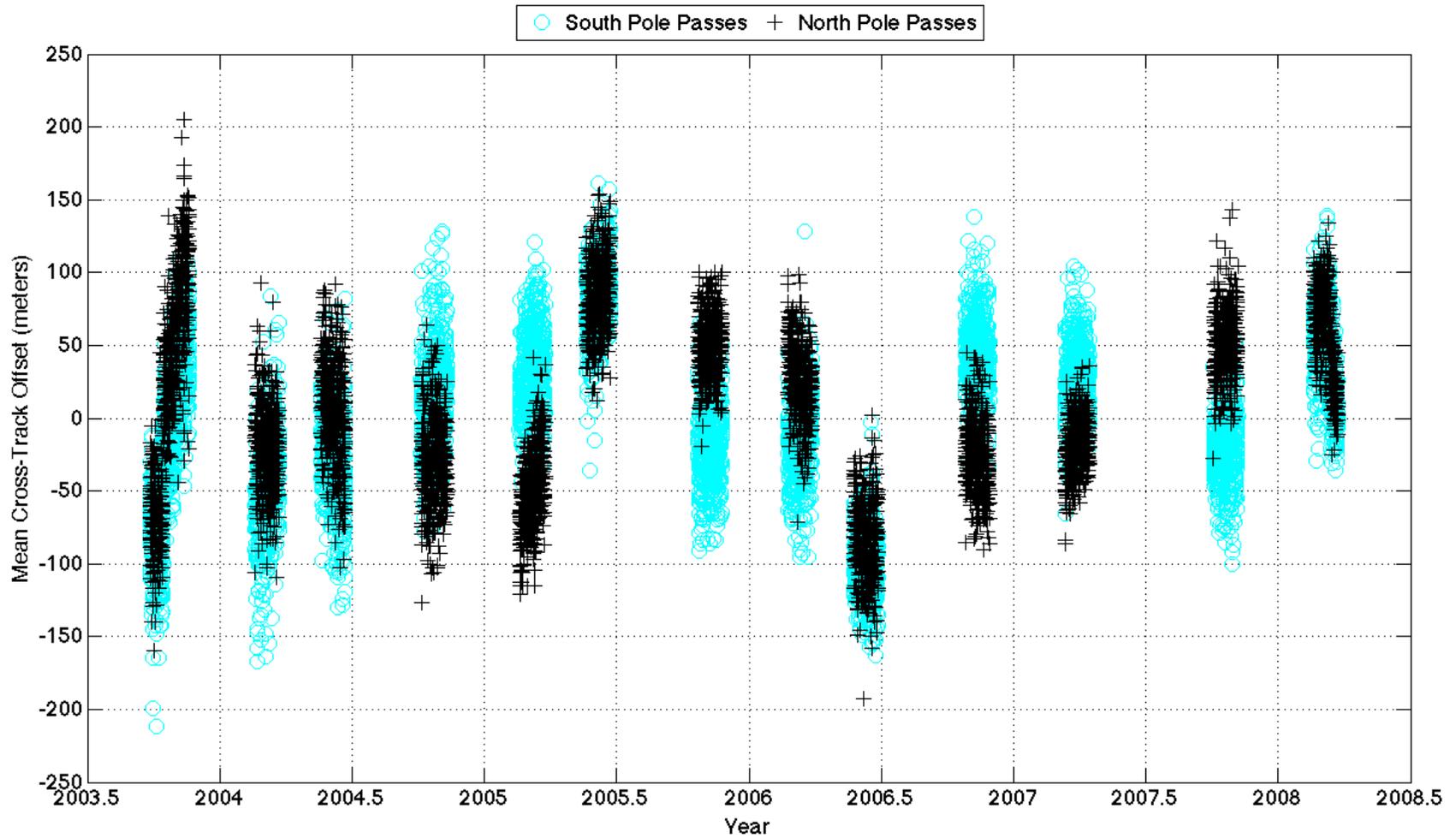


- Computed cross-track offsets for every shot in every campaign
- Computed mean offsets and standard deviations for north and south pole passes, where reference ground tracks are targeted

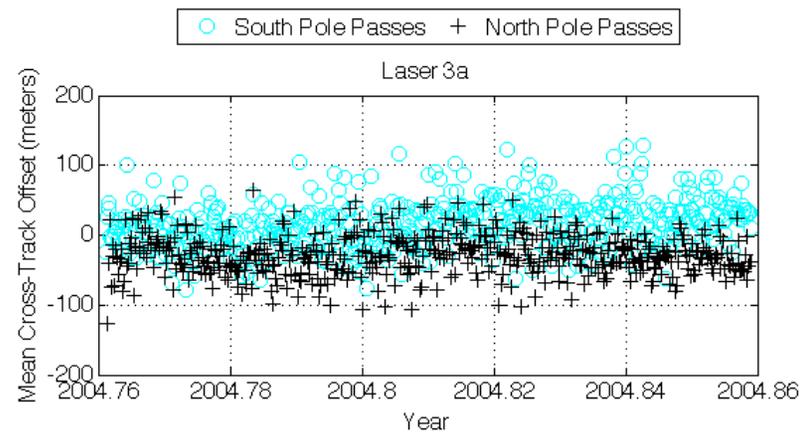
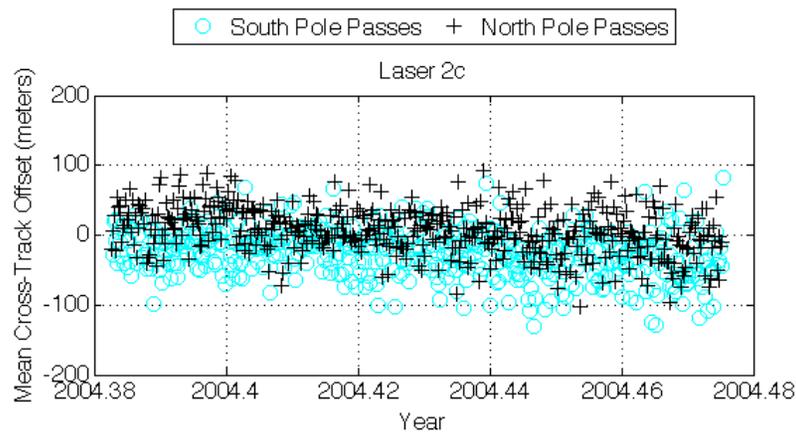
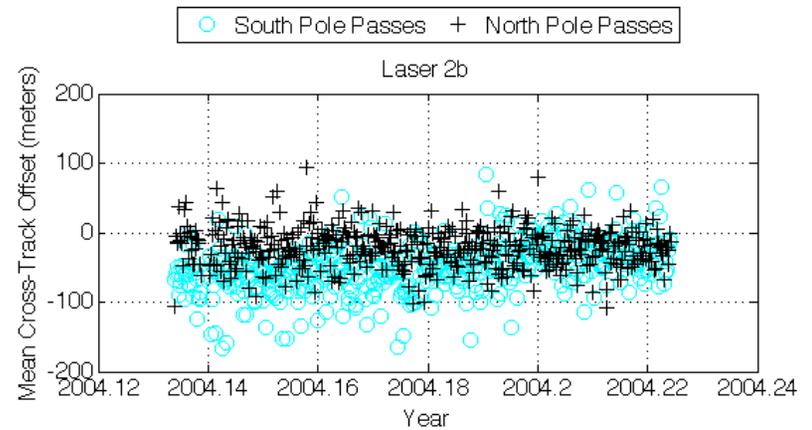
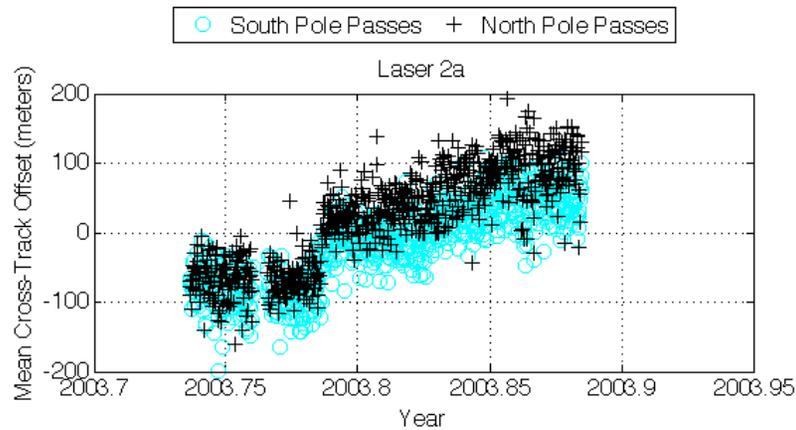
Mean Cross-Track Offsets (by Campaign)



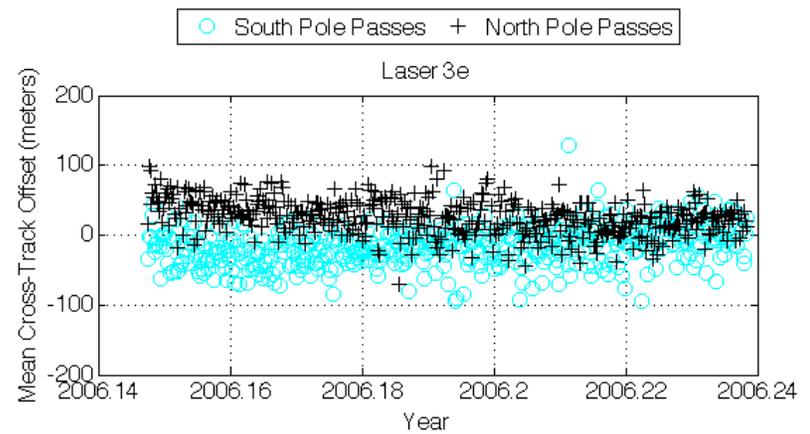
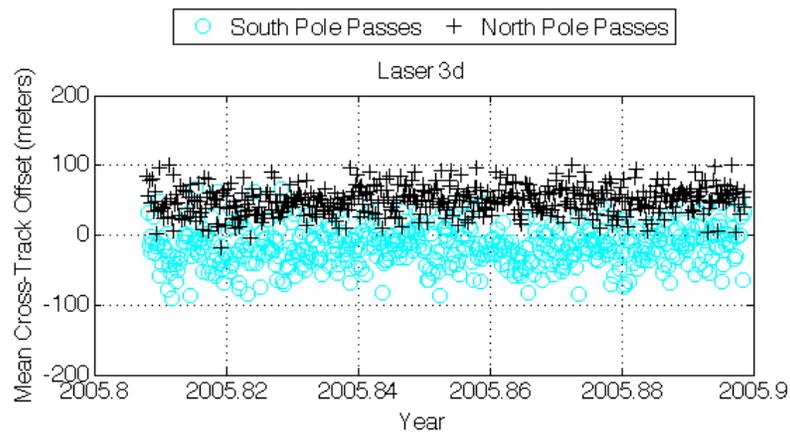
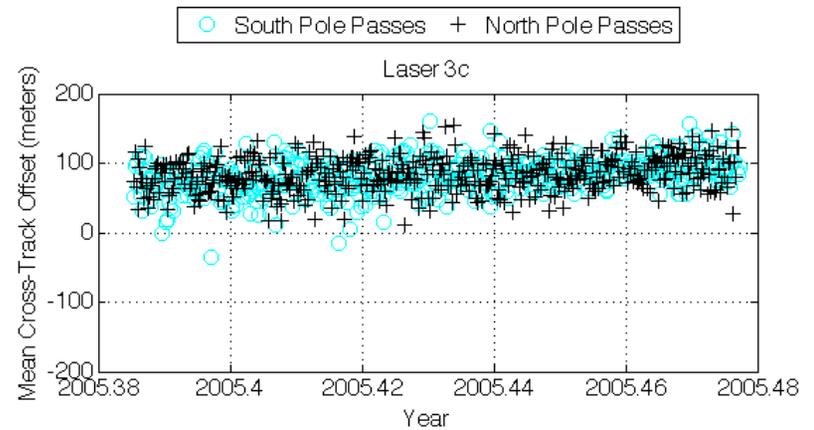
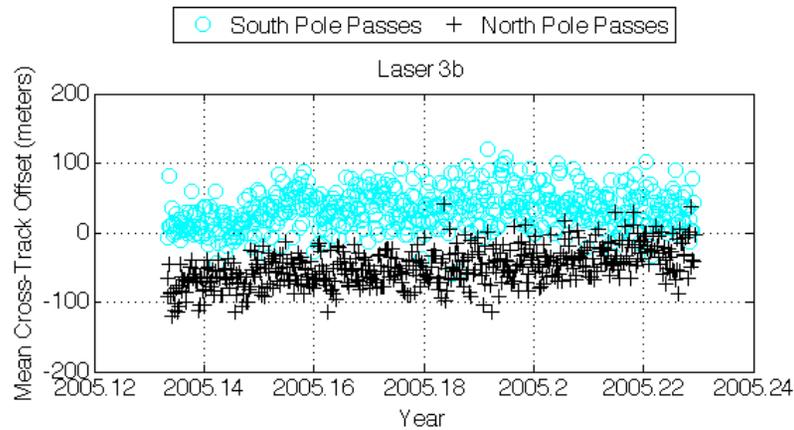
Mean Cross-Track Offsets (by Track)



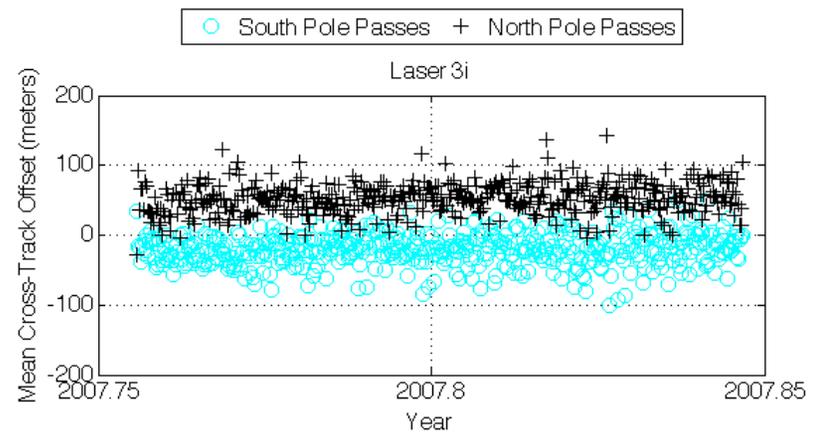
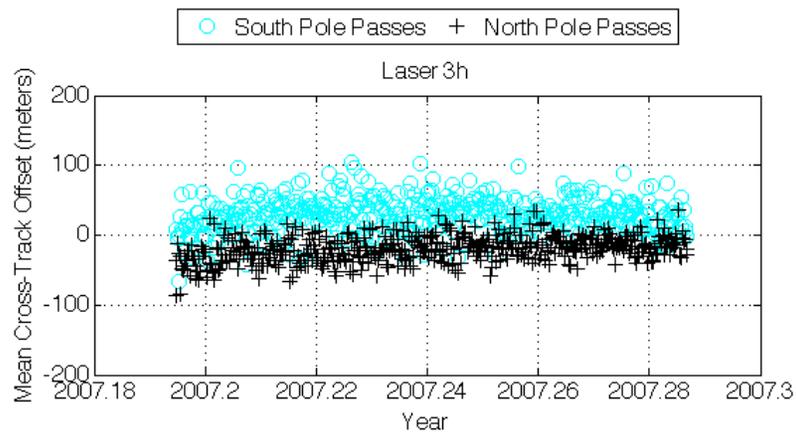
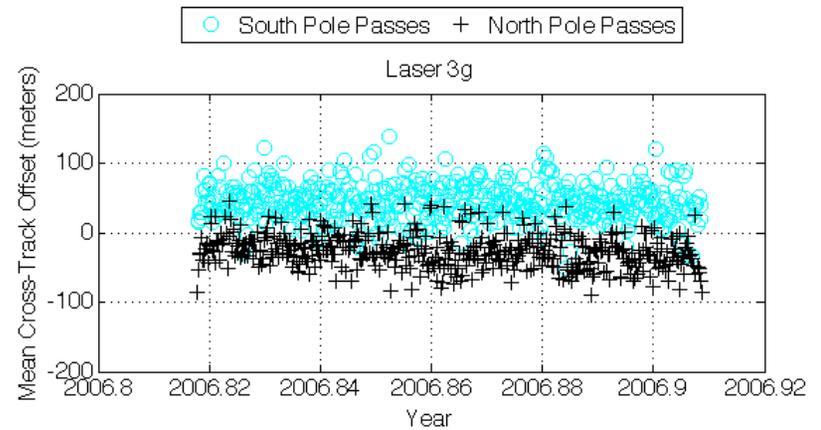
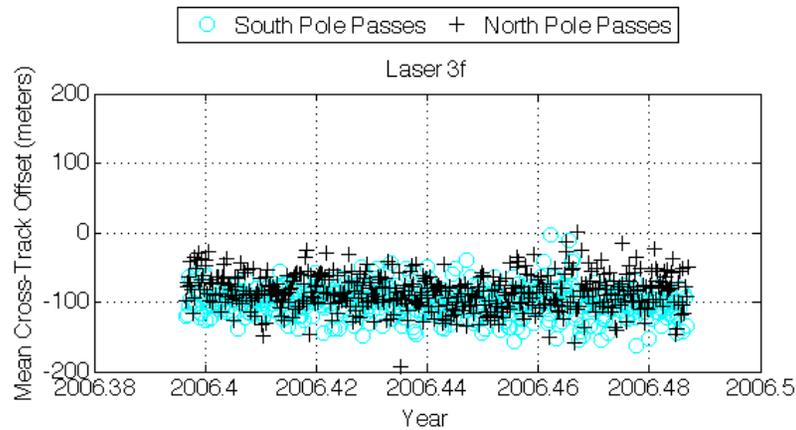
Mean Cross-Track Offsets: L2a-L3a



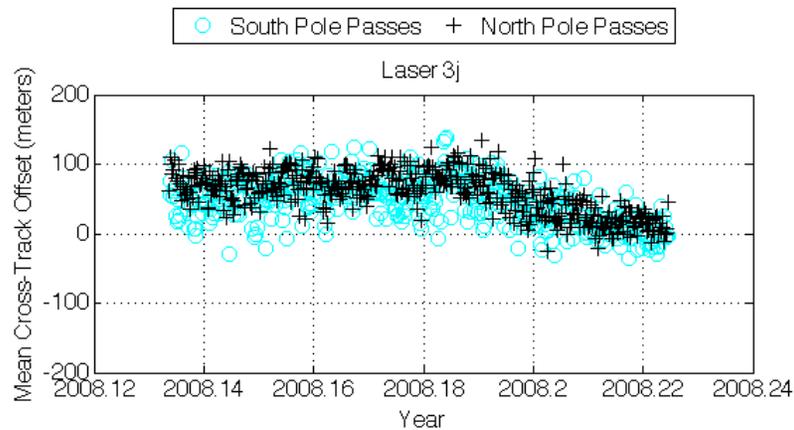
Mean Cross-Track Offsets: L3b-L3e



Mean Cross-Track Offsets: L3f-L3i



Mean Cross-Track Offsets: L3j



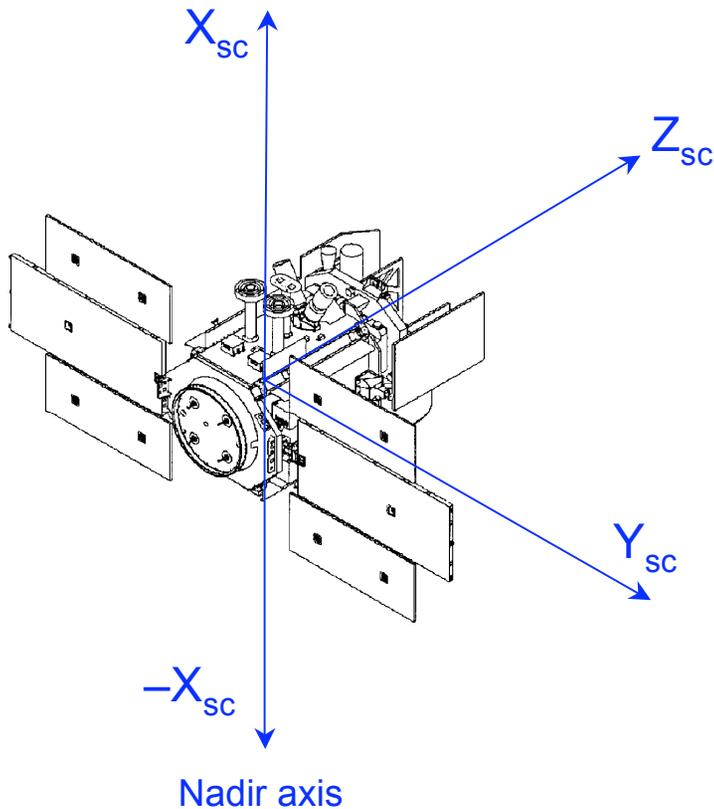
Significant changes in performance observed during L2a due to on-board temperature changes

Smaller trends observed in L2c, L3b, L3j

Differences in cross-track offsets between north and south pole passes suggests existence of orbital variation

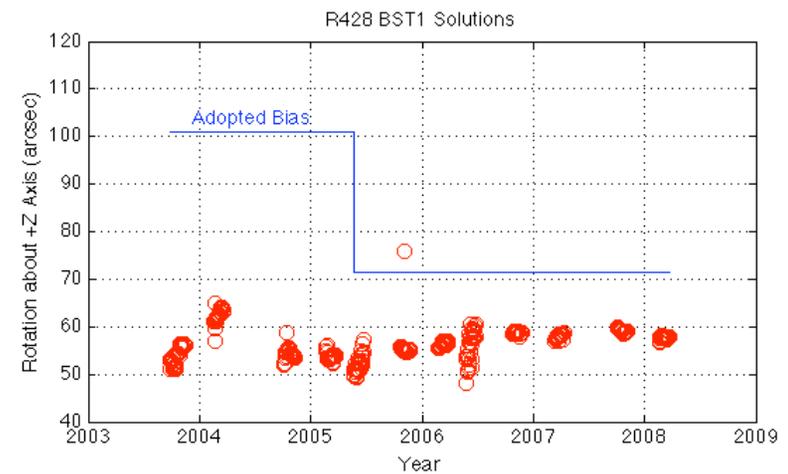
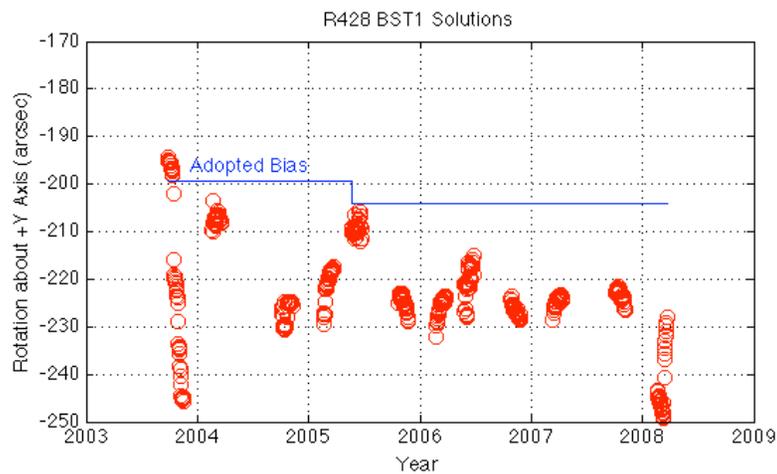
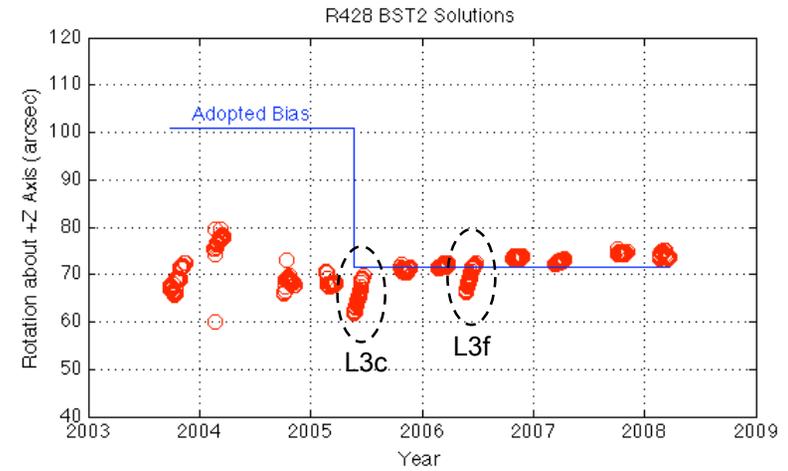
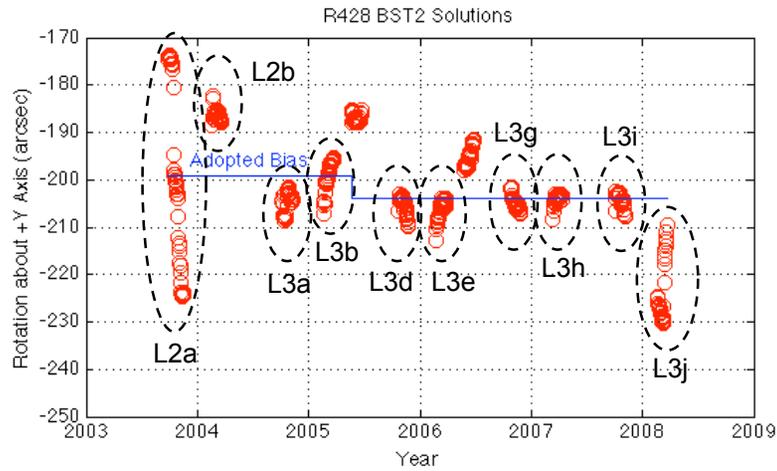
This and inter-campaign variations may be due to motion of GLAS with respect to spacecraft bus, motion of the BSTs, on-board attitude determination errors, or actual laser motion

Laser Offsets from Nadir Axis

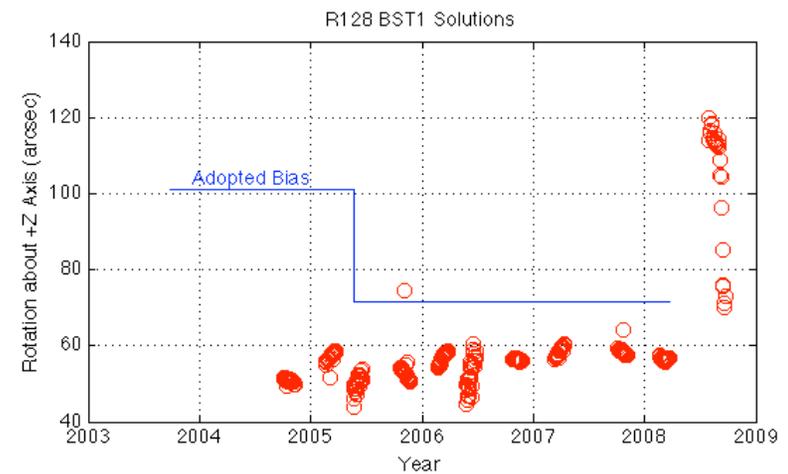
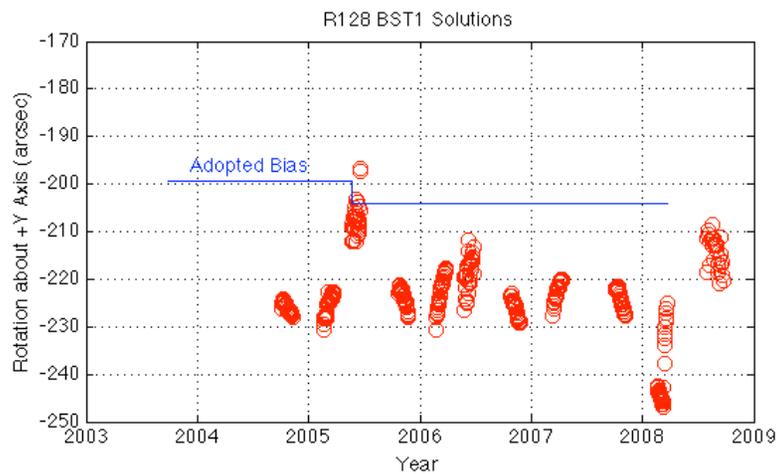
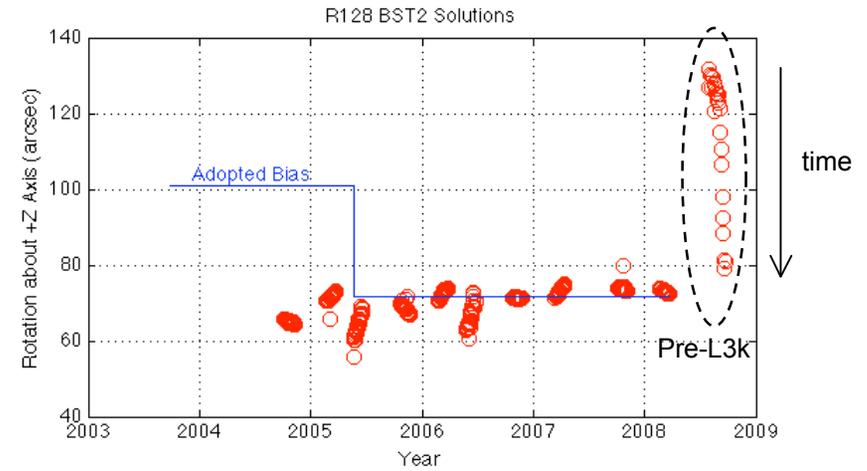
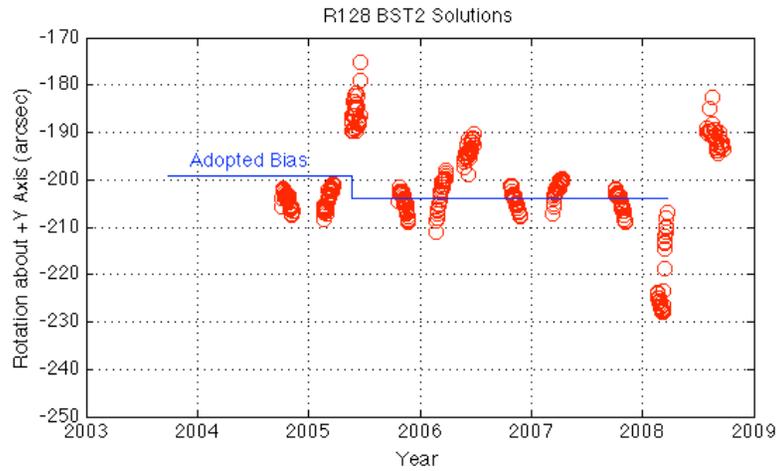


- In airplane modes, cross-track offsets dictated by rotation of laser about $+Z_{sc}$
- In sailboat modes, cross-track offsets dictated by rotation of laser about $+Y_{sc}$
- After Laser 1 ops, ground-based off-nadir targeting software changed to incorporate **mean** pitch and roll biases to compensate for laser offsets
- Offsets adjusted just prior to L3c

Daily Mean Laser Offsets



Daily Mean Laser Offsets: Pre-L3k



Conclusions



ICESat-I:

Continue to monitor offsets to assess whether changes in roll/pitch biases needed in future campaigns, especially for airplane mode operations

ICESat-II:

Better understand source(s) of cross-track offsets, and levy requirements accordingly