IDENTIFICATION AND REDUCTION OF RETRACKER-RELATED NOISE IN ALTIMETER-DERIVED SEA-SURFACE HEIGHT MEASUREMENTS

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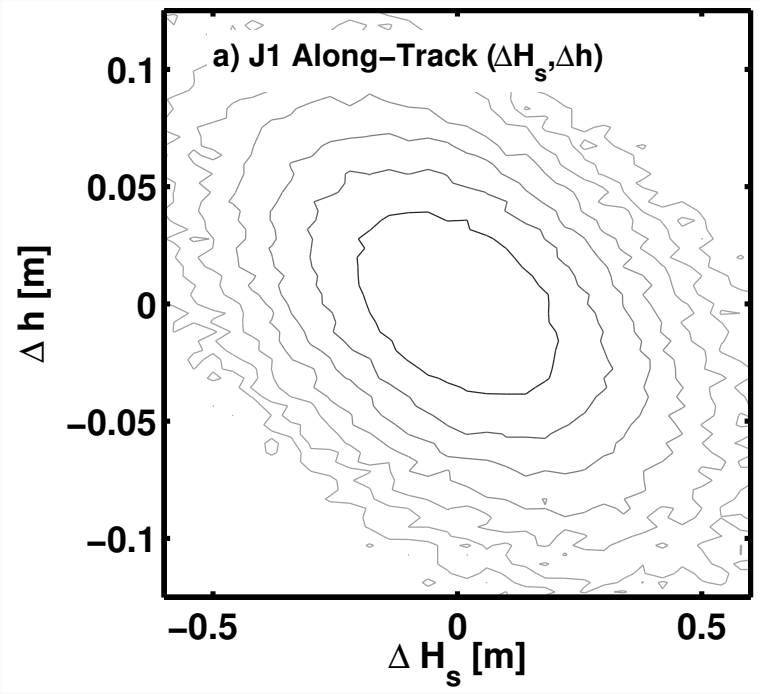
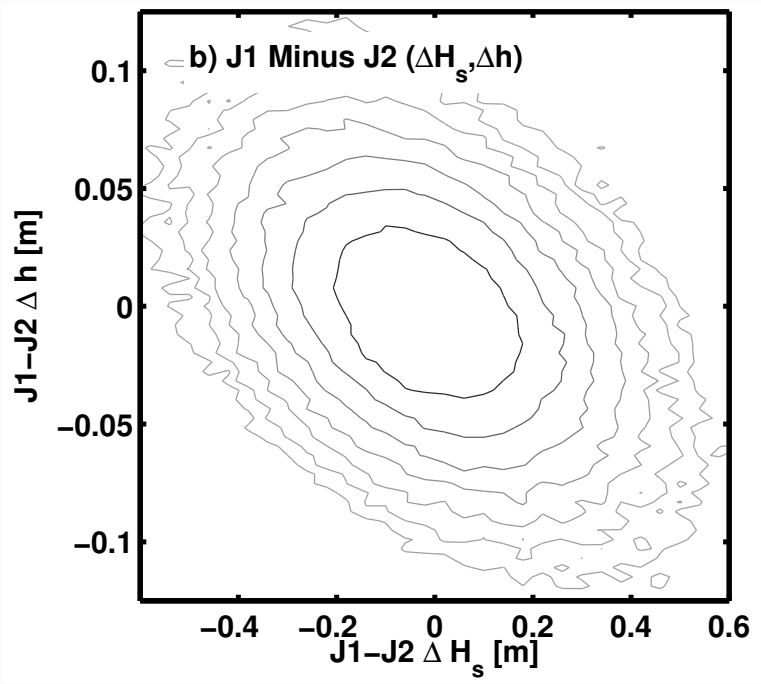
Ocean Surface Topography Science Team Meeting
Reston, VA October 20–23, 2015

MOTIVATION

Comparison of Jason-1 and Jason-2 during the calibration/validation orbit phase:





Expect physical correlation to be absent in J1-J2 differences.

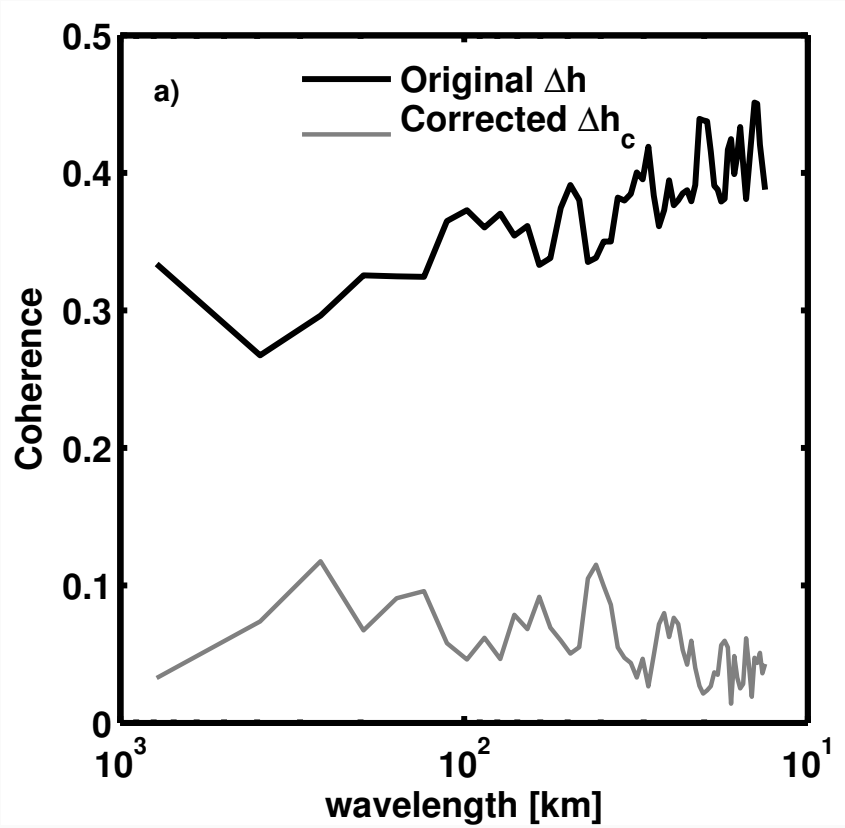
$\Longrightarrow$ correlated retracker error is cause

OUTLINE

- Cross-spectral analysis of J1/J2
- Empirical model to decorrelate $(\Delta H_s, \Delta h)$
- Variance reduction statistics
- Application to other missions

COHERENCE CROSS-SPECTRA

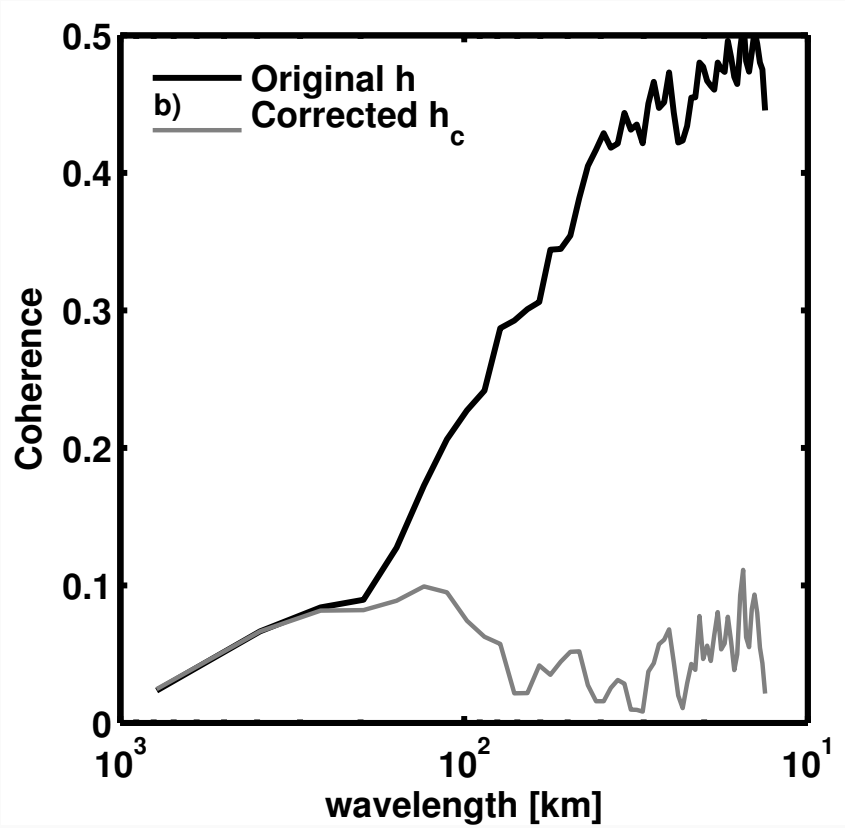
$(\Delta H_S, \Delta h)$, Jason-1 minus Jason-2



[SSH correction, to be developed, is $h_c = h - \rho(\overline{H}_S)\Delta H_S$.]

COHERENCE CROSS-SPECTRA

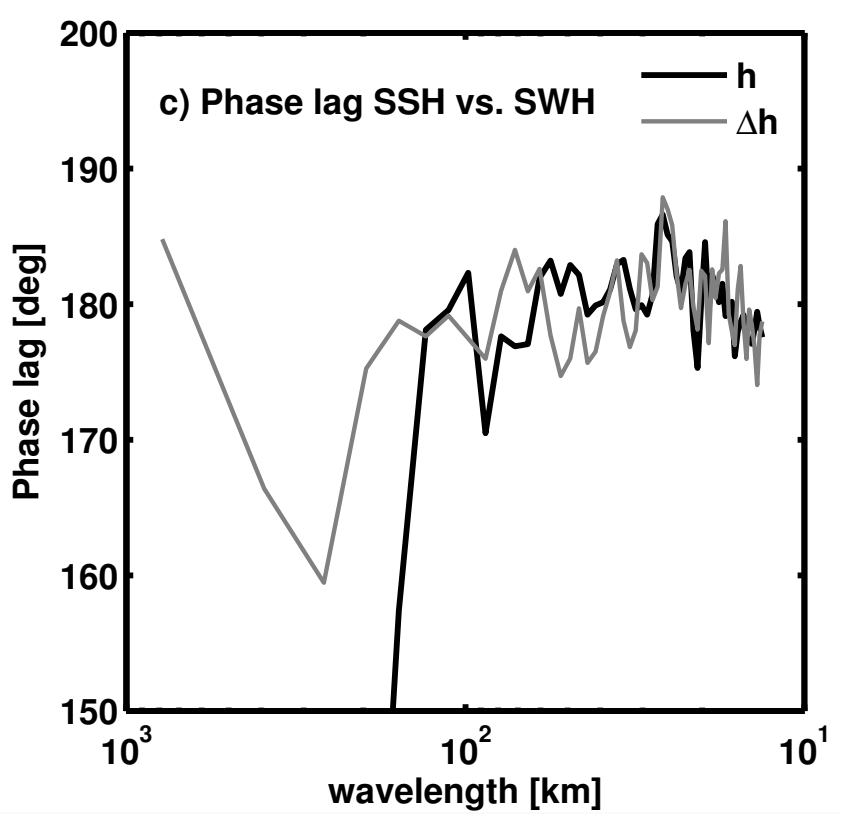
(H_s, h), Jason-1



[SSH correction, to be developed, is $h_c = h - \rho(\overline{H}_s)\Delta H_s$.]

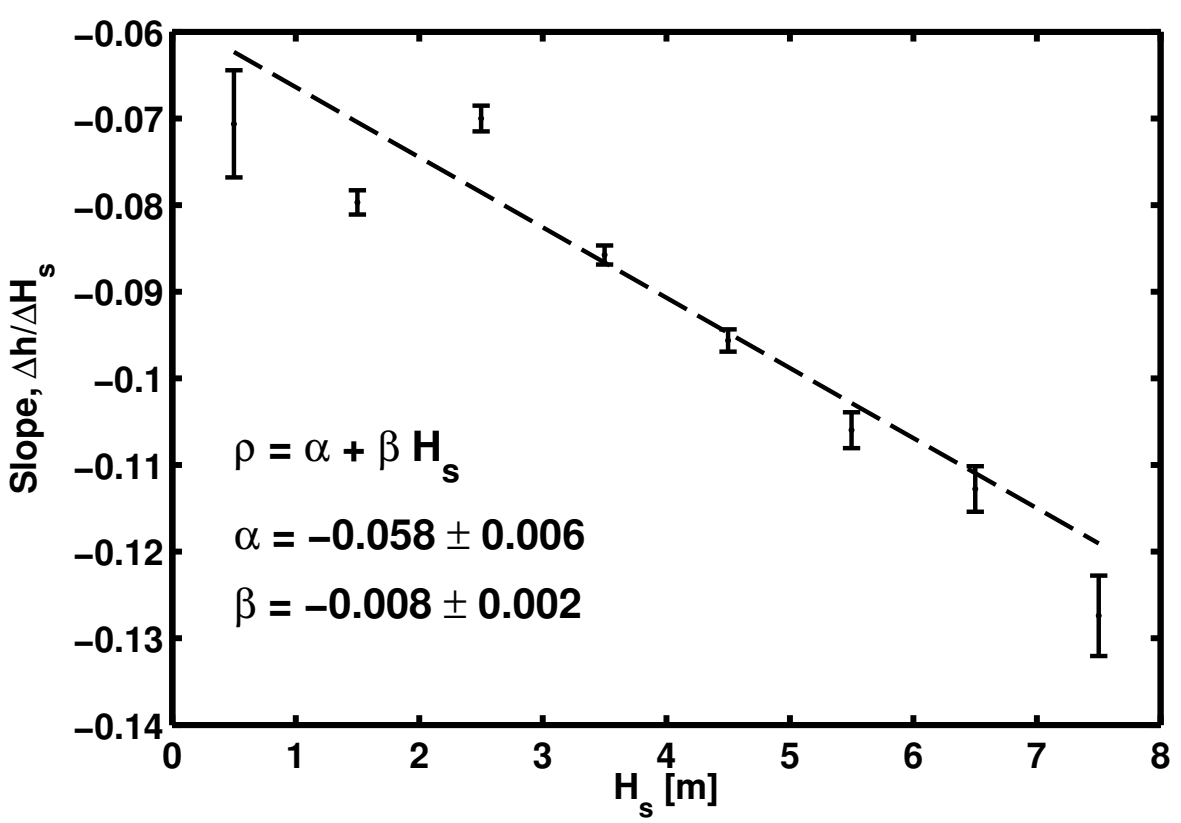
PHASE CROSS-SPECTRA

(H_s, h) and $(\Delta H_s, \Delta h)$



HYPOTHESIZED SSH CORRECTION

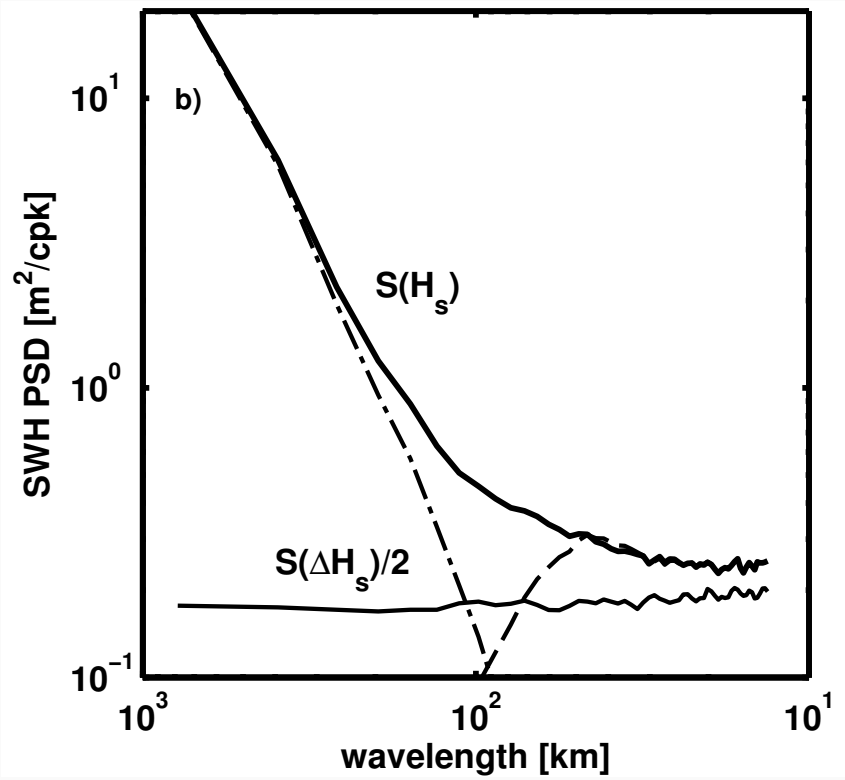
$$h_C = h - \rho(H_S)\Delta H_S$$



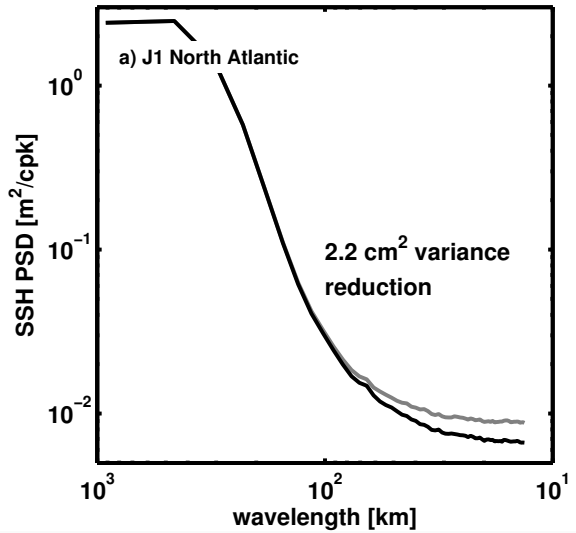
IMPLEMENTED SSH CORRECTION

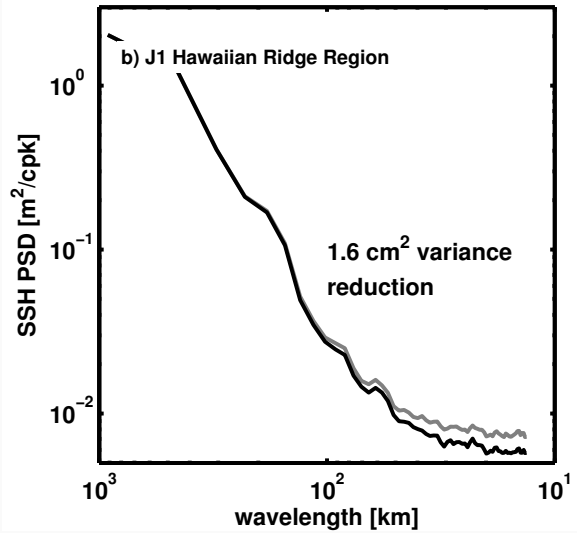
$$h_c = h - \rho(\overline{H}_s)H'_s$$

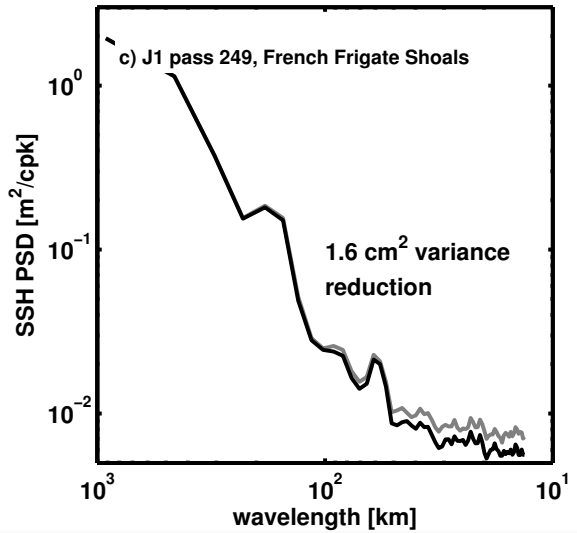
Estimate $\overline{H}_s$ with low-pass filter (100km); and $H'_s = H_s - \overline{H}_s$.



VARIANCE REDUCTION STATISTICS





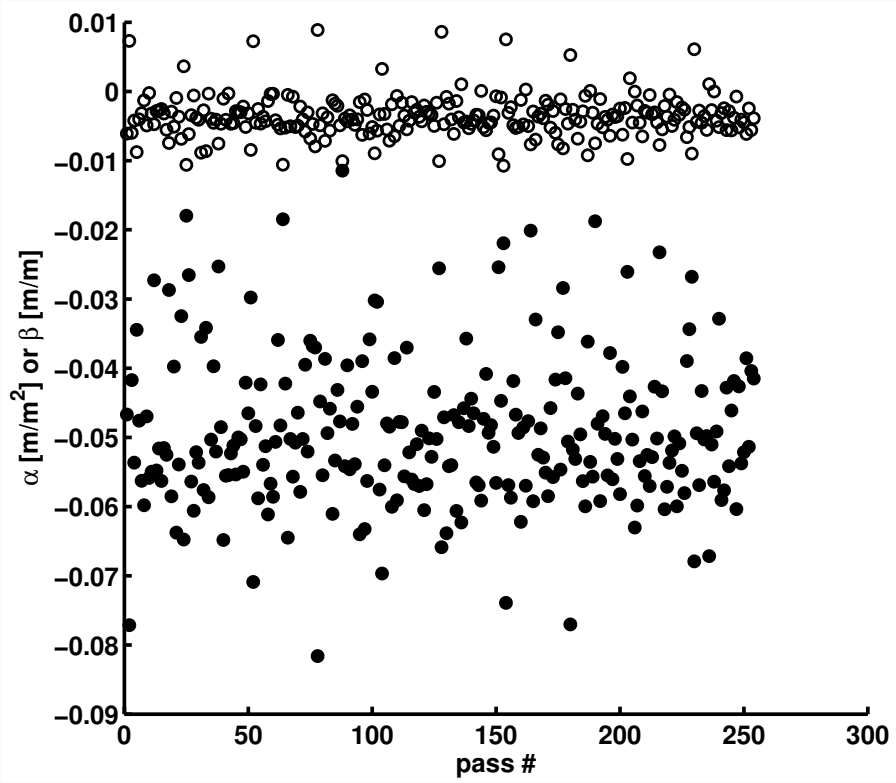


High-wavenumber noise floor reduced by 19% to 27%.

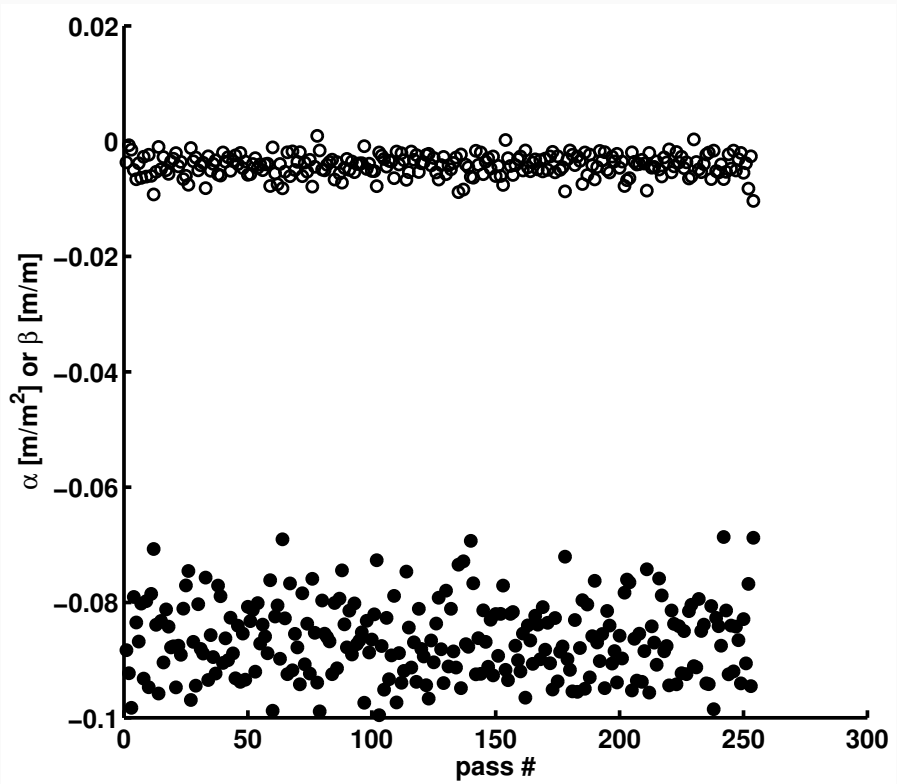
Variance reduction at crossovers agrees with along-track variance reductions.

APPLICATION TO OTHER MISSIONS

TXA



J1A



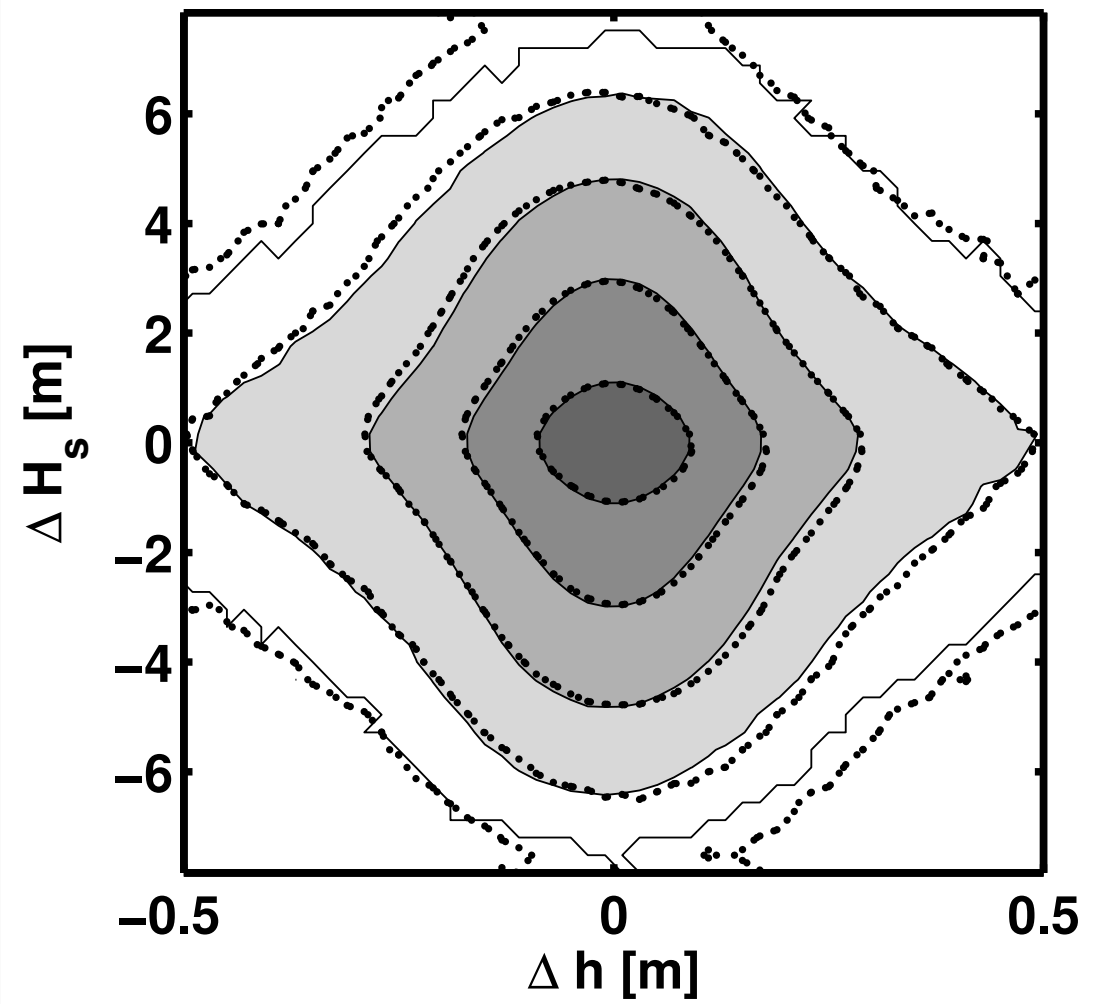
Regression coefficients computed from mono-mission data by taking along-track first-differences.

14% variance reduction in crossover analysis of internal tide from merged multi-mission data.

CONCLUSION

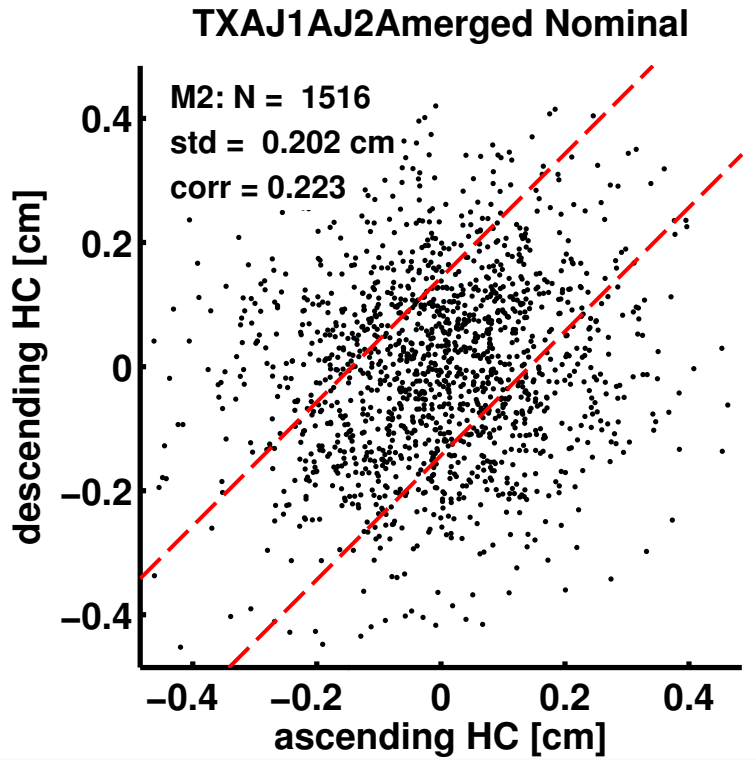
- An empirical approach to reducing the retracker-related SSH error was implemented, based on analysis of J1-J2 during the J2 cal/val orbit phase.
- The high-wavenumber SSH noise floor is reduced by about $2cm^2$, depending on SWH.
- The correction uses conventional 1 Hz data; although, it was inspired by 2-pass retrackers.
- The correction is not independent of the sea-state bias correction.
- Thanks: Robert deCarvalho, Douglas Vandemark, Soli Garcia, and David Sandwell.

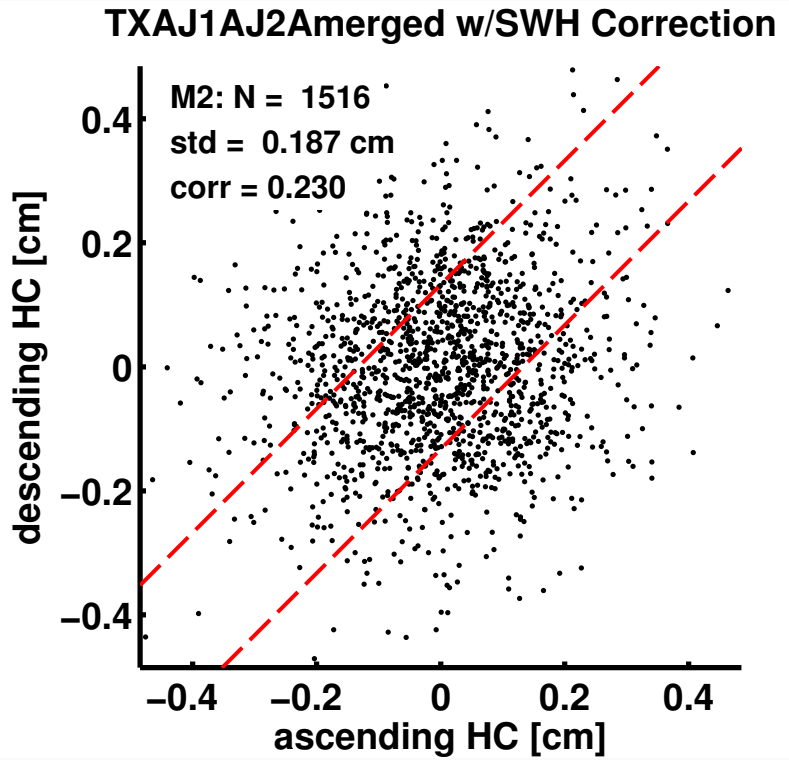
EXTRA 1: JOINT PDF OF SSH AND SWH INCREMENTS



The PDF is more symmetric after correction.

EXTRA 2: VARIANCE REDUCTION IN HARMONIC CONSTANTS





- Pacific Ocean, ±60° lat., depth > 2000m, dist. > 120km
- TPXO8 prior model for tides
- Aug 18 RADS update
- High-pass filtered HC (120km)

EXTRA 3: OTHER THOUGHTS

1. Along-track h_c are not statistically independent.
2. Rotate (H'_s, h') to correct both H_s and h?
3. Use time-lagged increments to distinguish physical and retracker-related (H_s, h) correlations?
4. Would the SSB correction be mission independent if the re-tracker error correlation could be eliminated?