Global Multi-Mission Crossover Calibration
First Results for Jason-2

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Outline

- Discrete Crossover Analysis (DCA)
- Multi-Mission Crossover Calibration Results
- First Results of Relative Calibration of Jason-2 Altimeter

Discrete Crossover Analysis (DCA)

Input Data:

- Crossover differences in all combinations (single- and dual-satellite)
- Max. time difference 3 days

Model:

- Radial errors of the two passes per crossover were modeled
- Weighted least squares adjustment minimizing both,

  crossover differences *and* consecutive errors
- No analytical function for the radial errors
- Segmentation with time intervals of 3+10+3=16 days
- Sum of errors of reference mission are forced to zero; avoids rank defect (relative calibration w.r.t TOPEX or Jason-1)

Error Decomposition

- Post processing per mission and cycle: Splitting radial errors into relative range biases and centre-of-origin shifts

- Least squares adjustment

$$x_i + v_{x_i} = \Delta r + \Delta x \cdot \cos\varphi \cos\lambda + \Delta y \cdot \cos\varphi \sin\lambda + \Delta z \cdot \sin\varphi$$

x_i : *radial errors* (*from DCA*)

Δr : *relative range bias*

$\Delta x, \Delta y, \Delta z$: *centre – of – origin shifts*

- Geographically correlated errors (mean and variable part) accessible through sum/difference of ascending/descending errors

Multi-Mission Crossover Calibration

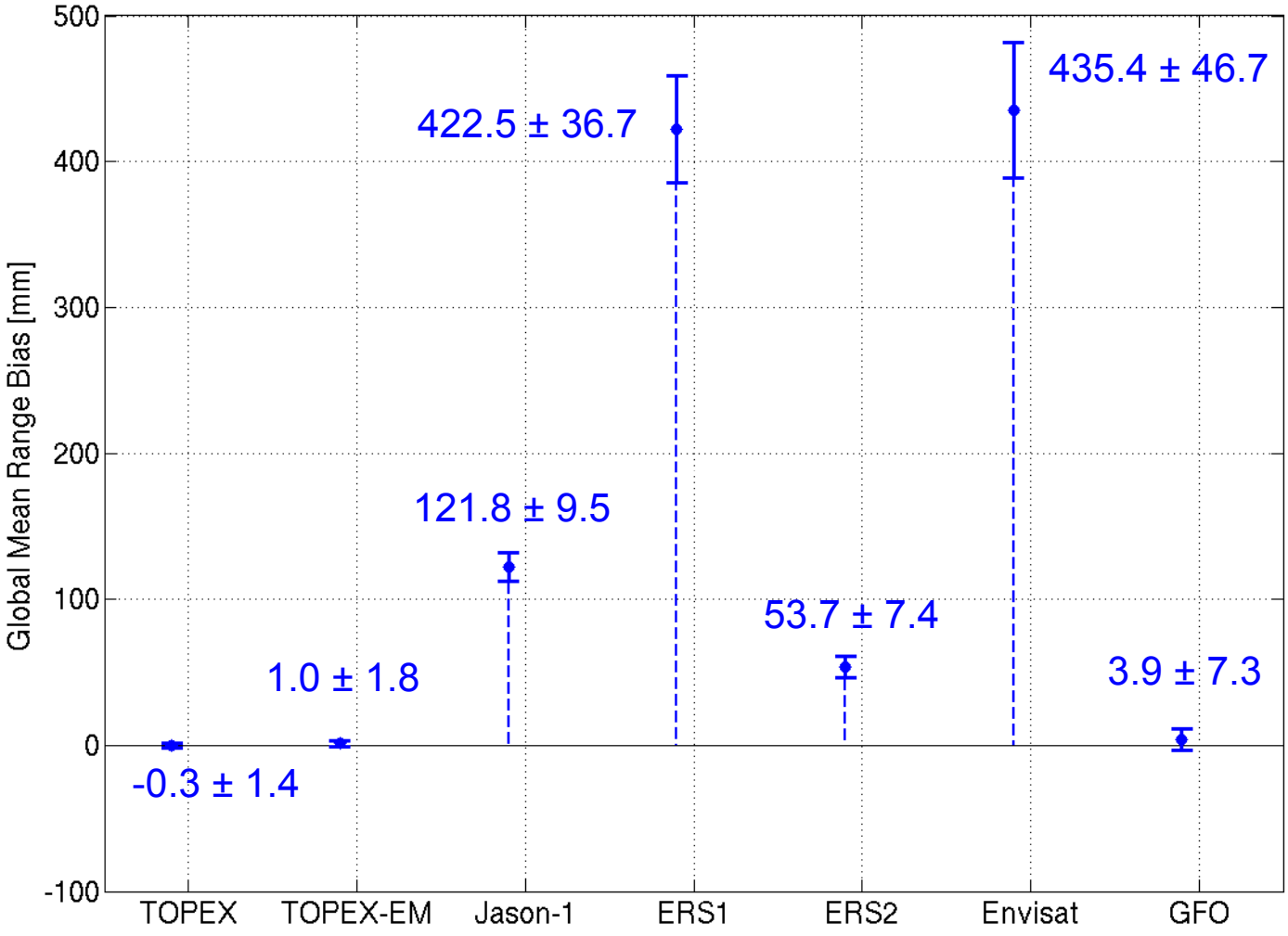
Input Data:

- Data from TOPEX, Poseidon, ERS-1, ERS-2, GFO, Jason-1, ENVISAT, and ICESat analysed for period 1992 - 2007
- Consistent models (e.g. tides, ionosphere, DAC, ...) whenever possible

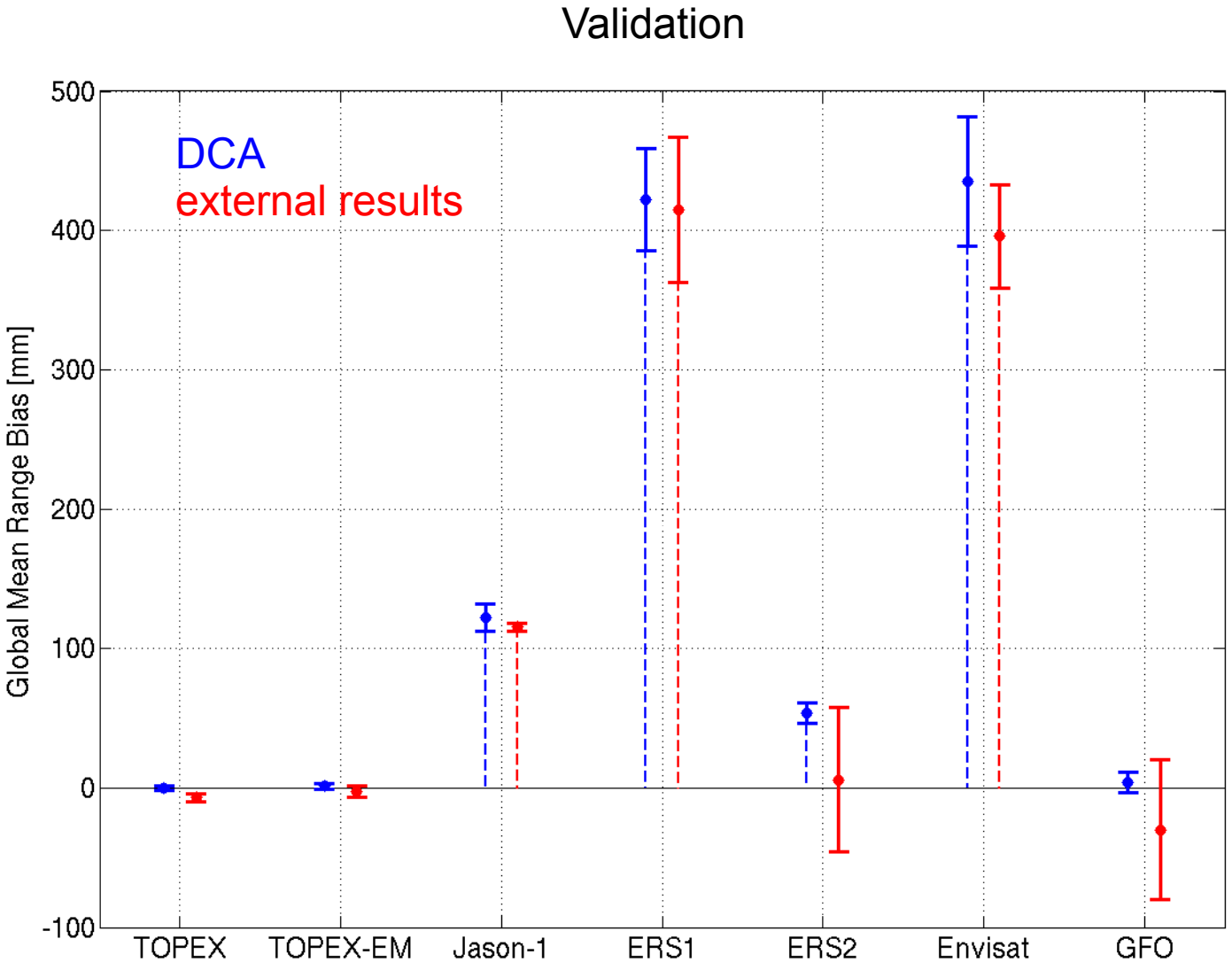
Results (per mission):

- Radial Errors (time series, spectral properties assessable)
- range biases per 10 days and global mean range biases
- Centre-of-origin shifts
- Geographically correlated errors

Global Mean Range Bias per Mission

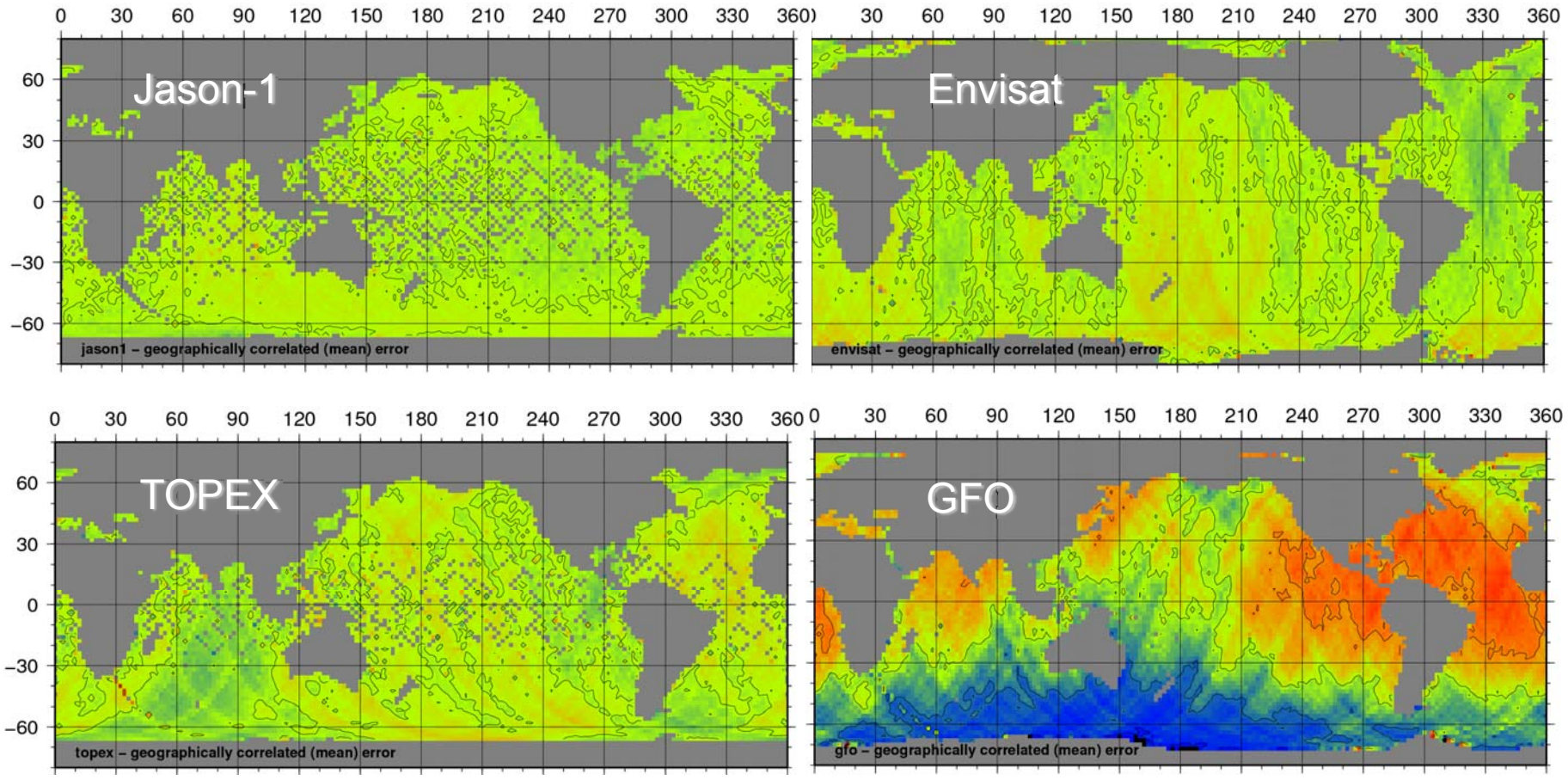


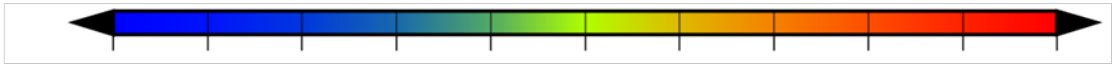
Global Mean Range Bias per Mission



Geographically Correlated Mean Errors

Mean range biases removed





-0.05 -0.04 -0.03 -0.02 -0.01 0.00 0.01 0.02 0.03 0.04 0.05 [m]

First Results for Jason-2

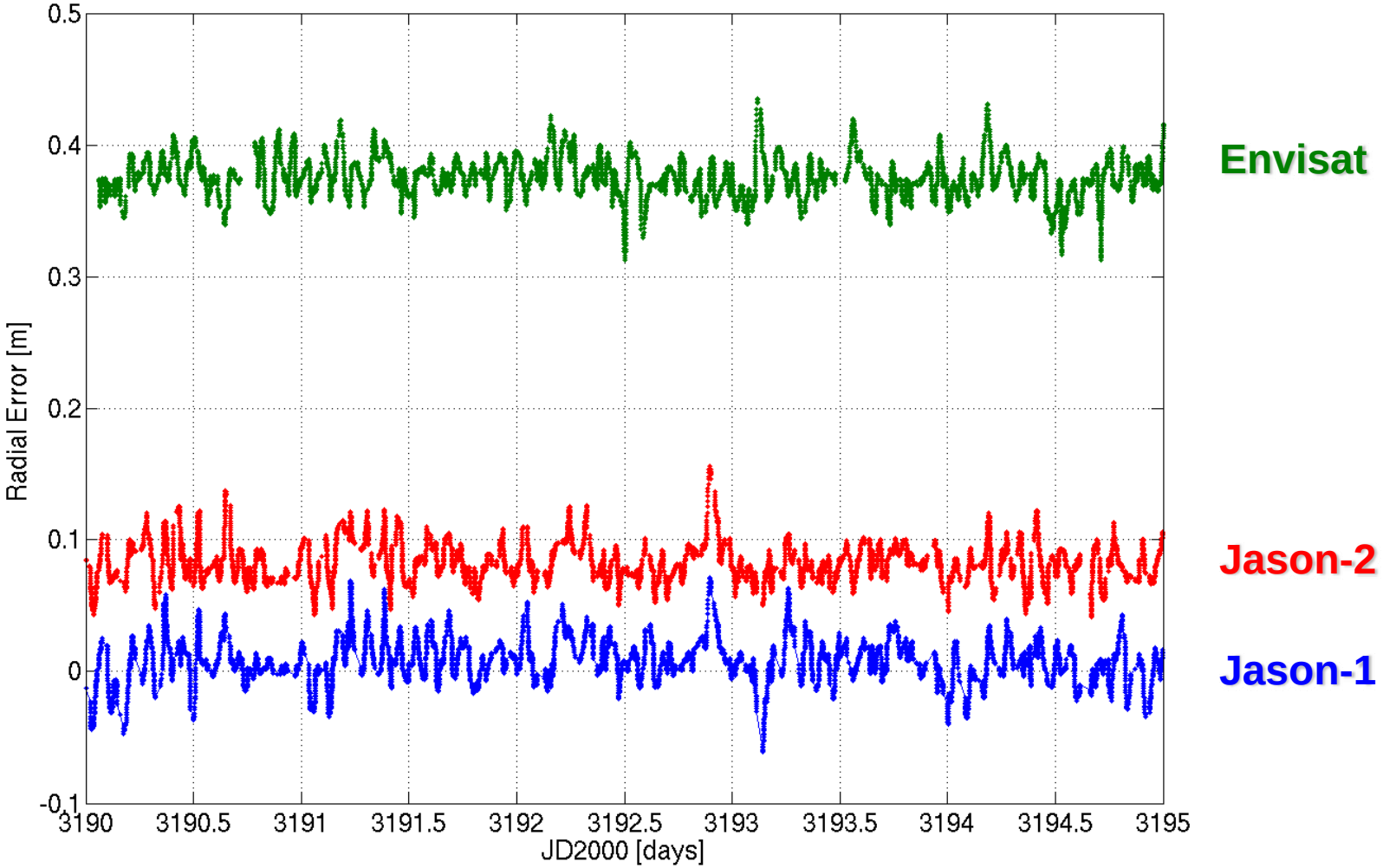
- Jason-2 GDR not yet included in the last Multi-Mission Crossover Analysis
- Only IGDR-C available

Input Data:

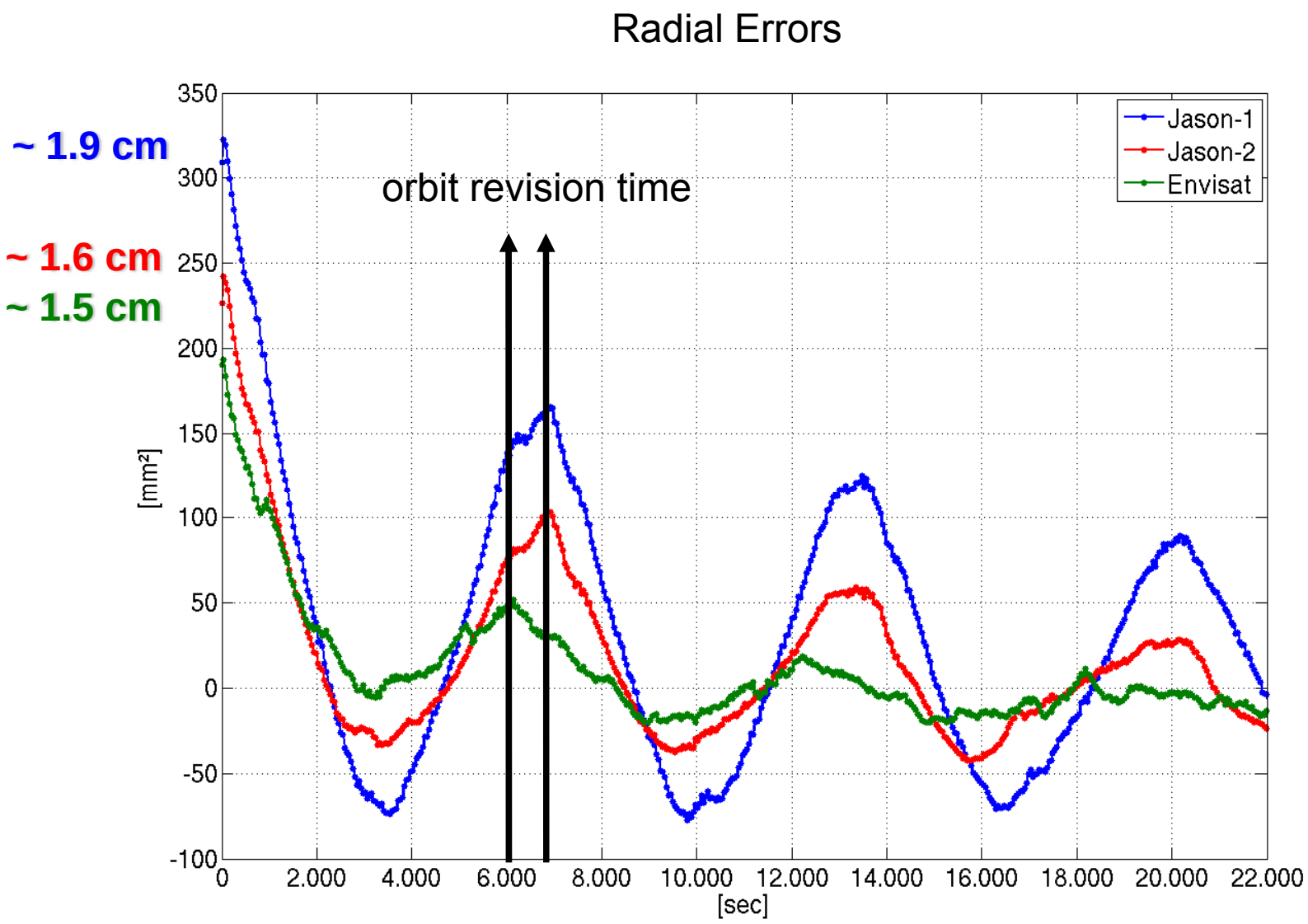
- IGDR for 3 missions: Jason-1, Jason-2, and Envisat
- Jason-1 as reference mission (relative calibration w.r.t Jason-1)
- Time interval of 9 cycles (240-248)
- Ocean tides: EOT08a
- Ionosphere: smoothed for Jason, JPL GIM for Envisat

Subset of Estimated Errors

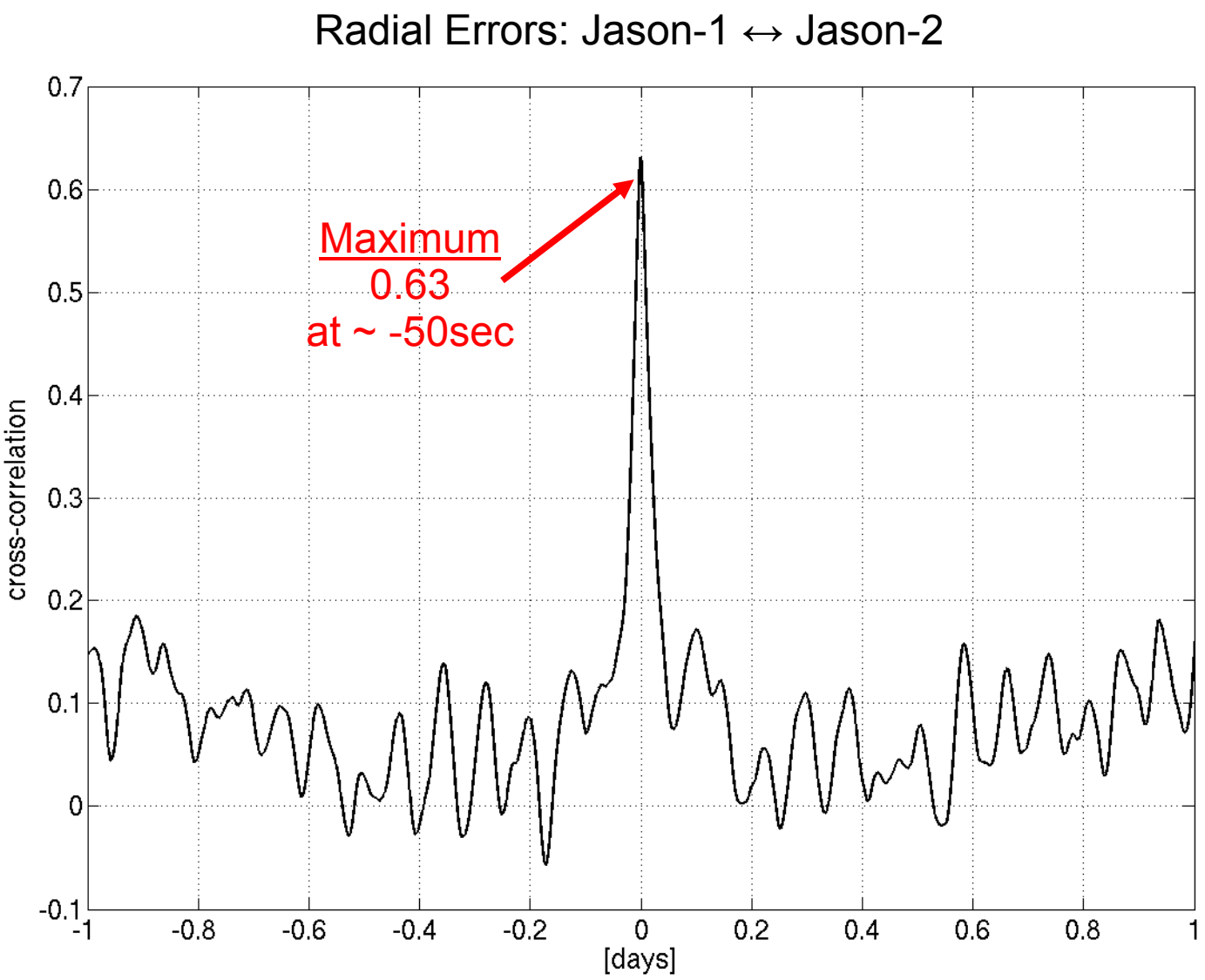
(Jason-1 as reference mission)



Auto-Covariance Function



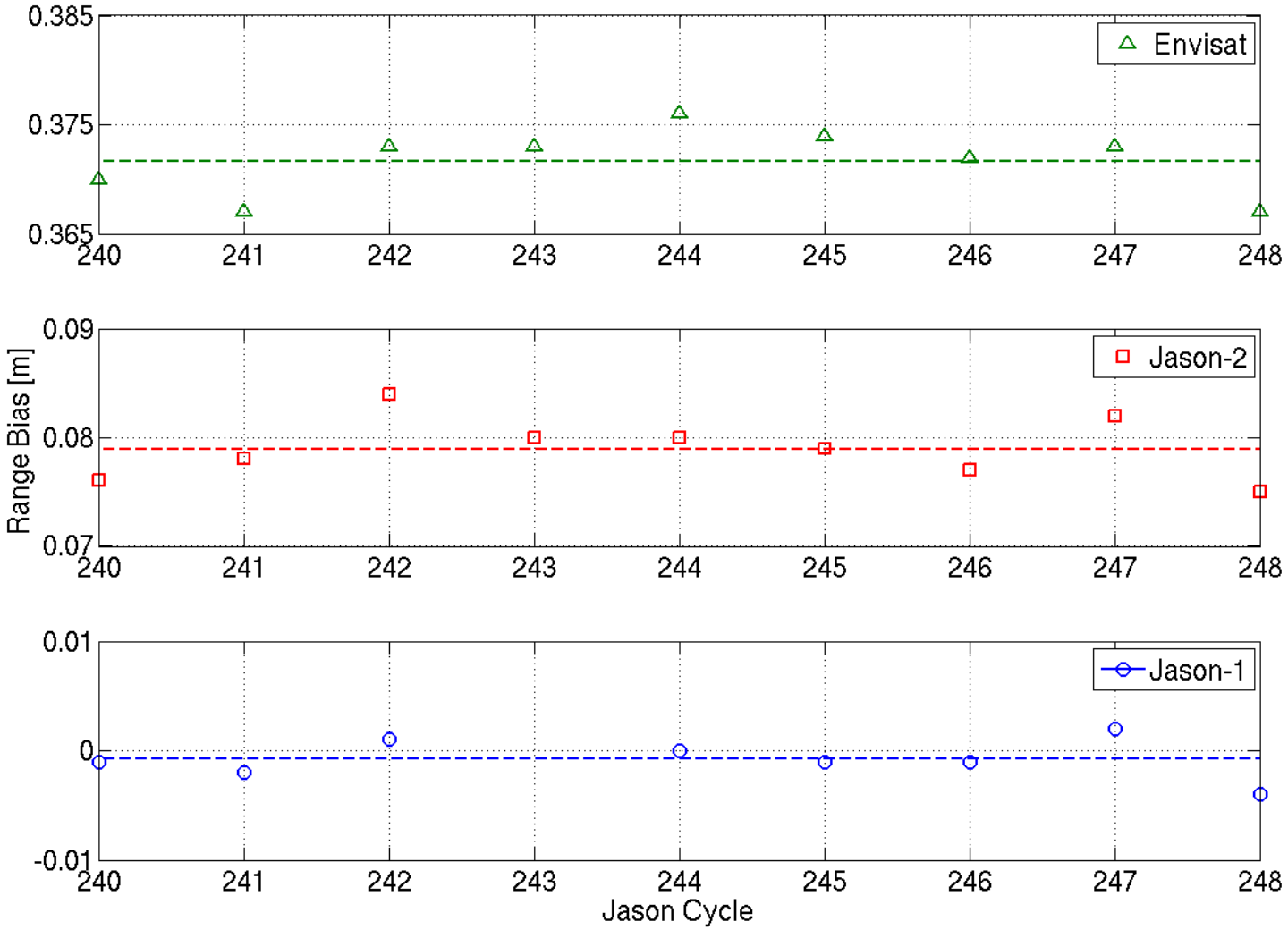
Cross-Covariance Function



computed from 10 days (JD3190 to 3200)

Relative Range Biases

(w.r.t. Jason-1)

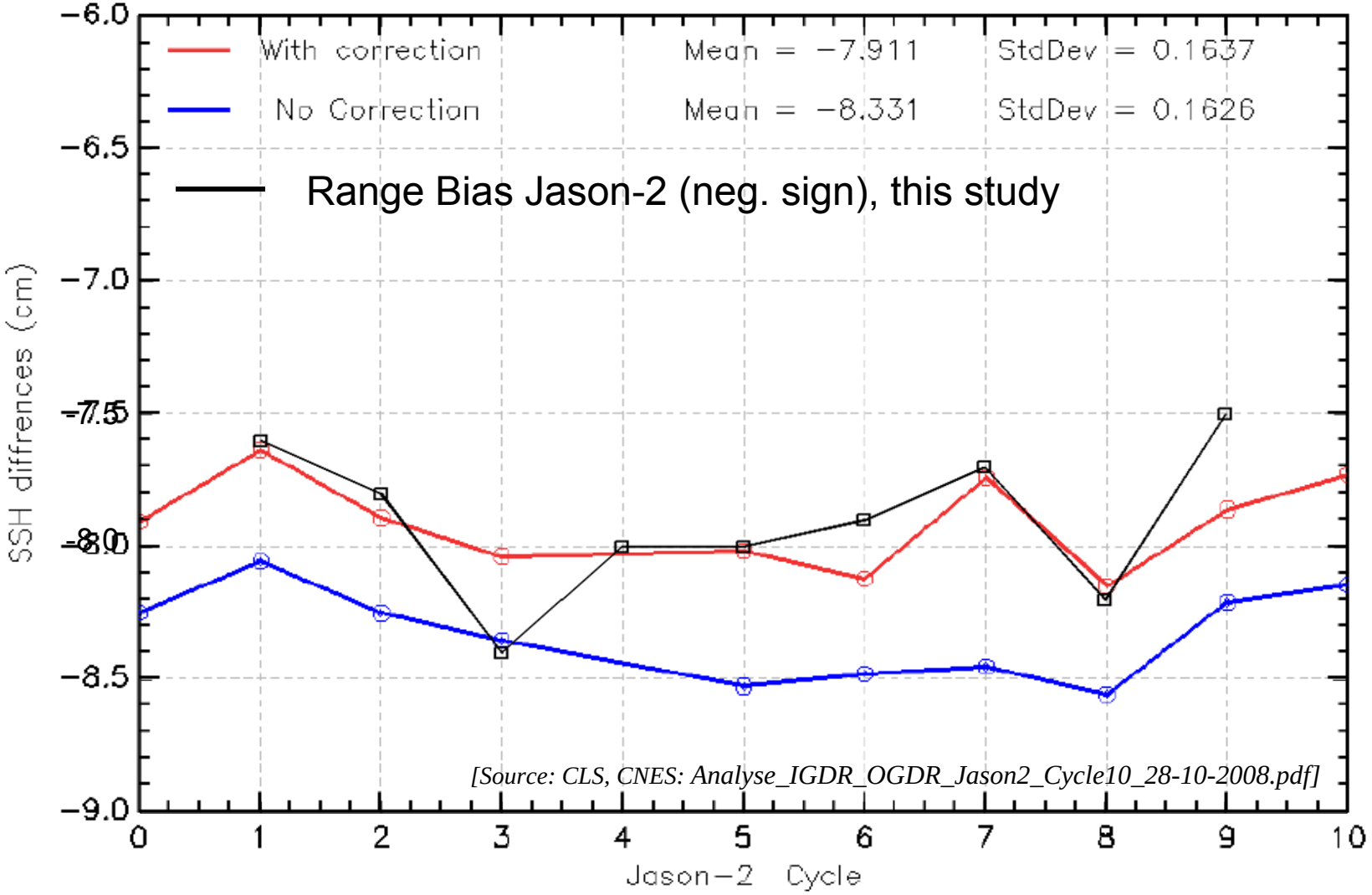


37.2 ± 0.1 cm

7.9 ± 0.1 cm

-0.1 ± 0.1 cm

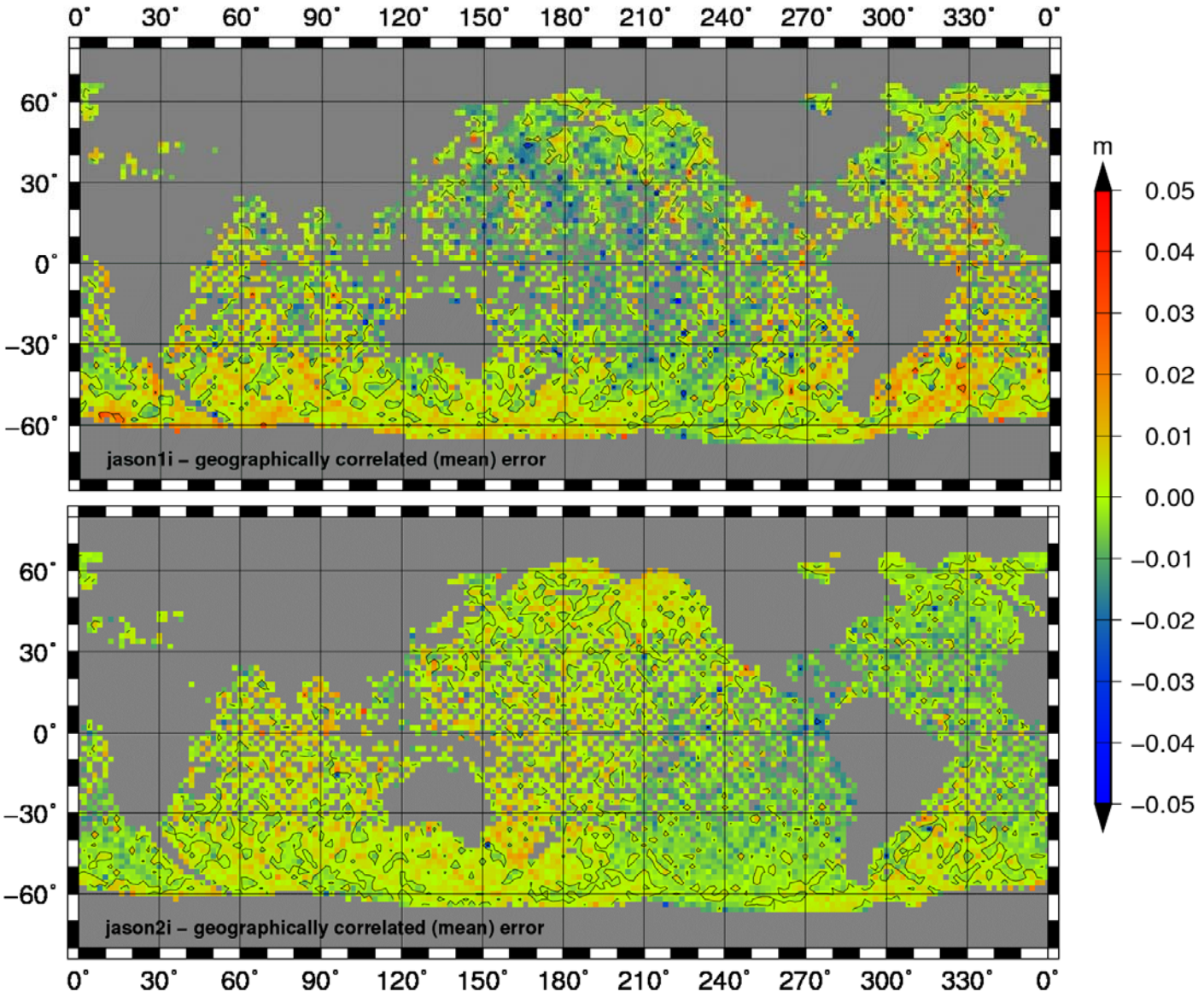
Range Bias - Validation



Relative Centre-of-Origin Shifts

Geographically Correlated (Mean) Errors

Jason-1



Conclusions

Discrete Crossover Analysis

provides ...

- ... radial errors with high temporal and spacial resolution
- ... range biases as well as centre-of-origin shifts
- ... geographically correlated errors

is not limited ...

- ... to special missions
- ... to special orbit configurations (e.g. tandem flights)

shows ...

- ... good agreement in global mean range bias with results from other calibration methods
- ... a relative range bias between Jason-1 and Jason-2 of 7.9 cm