Results from Inter-Satellite and Independent Calibration and Validation for Jason-3

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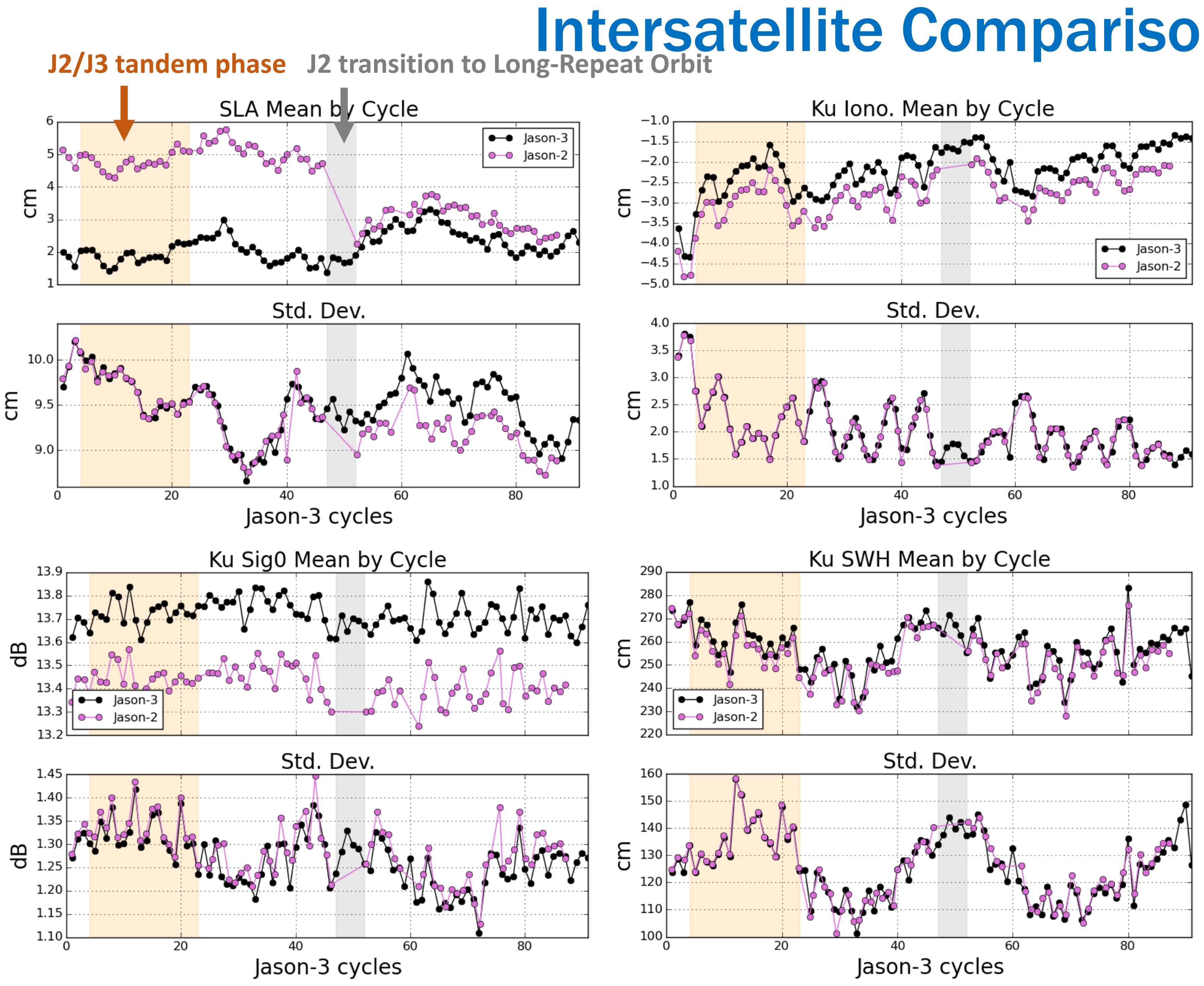
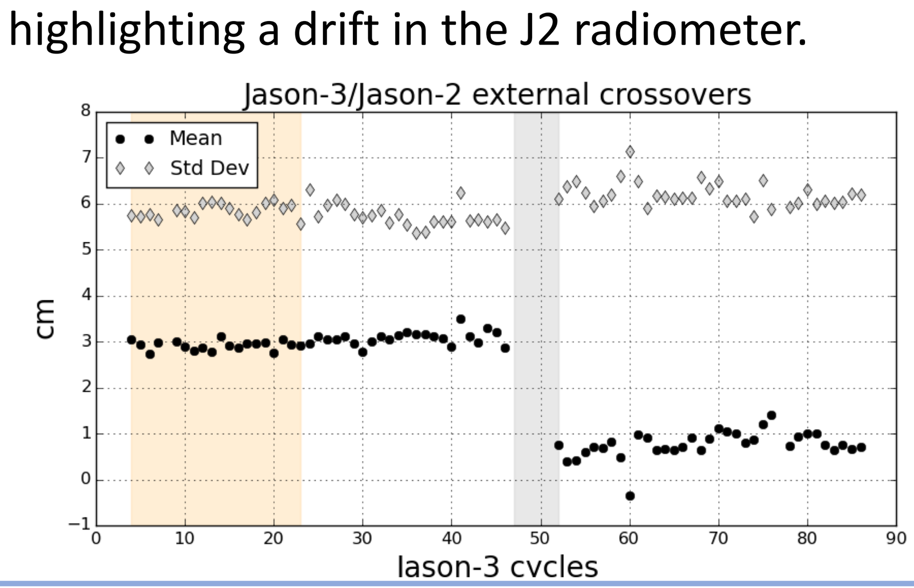
Summary

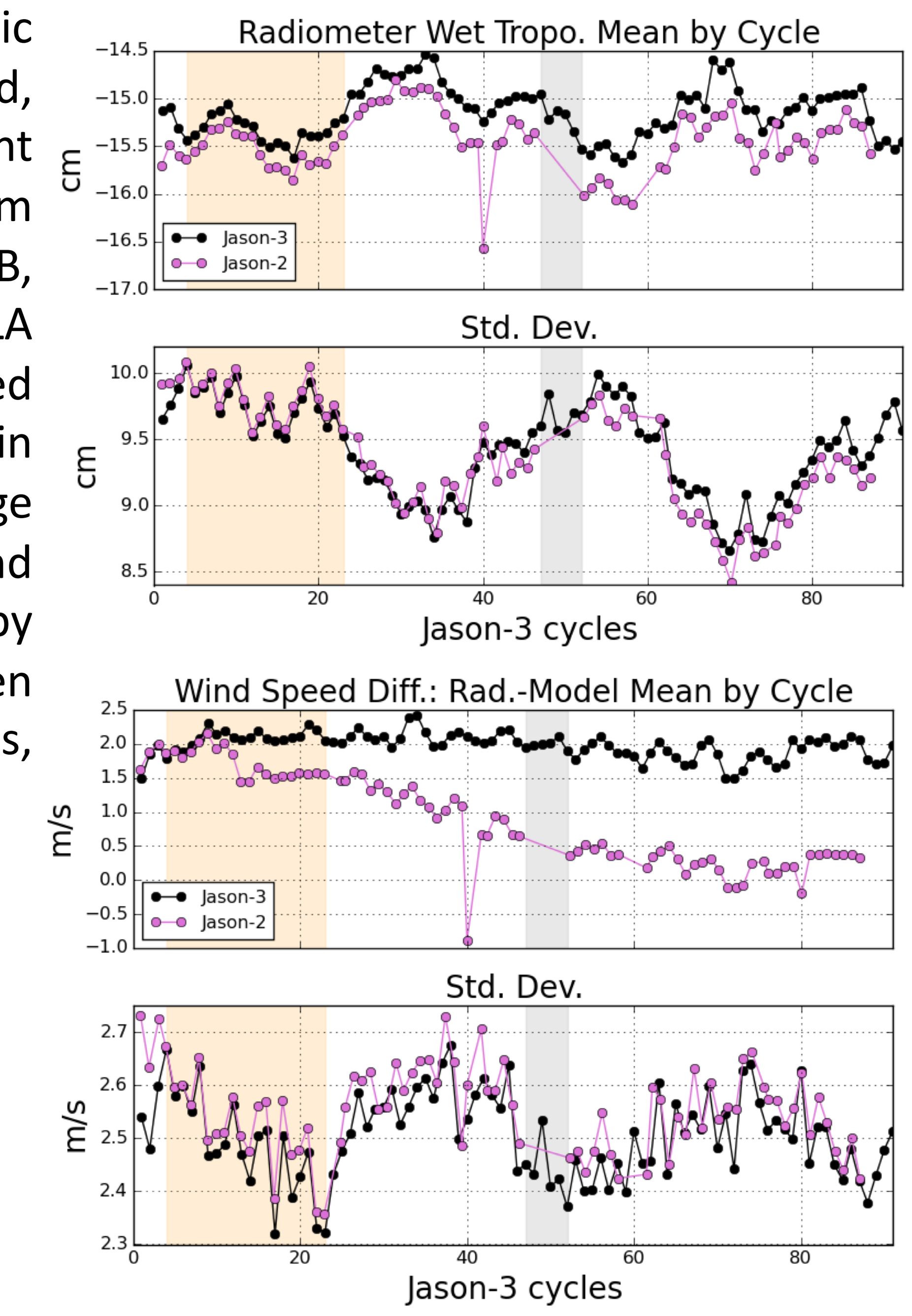
The Jason-3 (J3) mission has been the reference altimetry mission since October 2016, following the end of the tandem phase with Jason-2 (J2). In this poster, we assess the quality and consistency of the Jason-3 science data products and focus on intersatellite comparisons. First, the evolution of along-track statistics against Jason-2 parameters is presented, along with the temporal behavior of external crossovers (J2-J3). Finally, newly generated JPL GPS-based orbit solutions offer an independent assessment of the GPS/DORIS-based solutions provided in the standard Geophysical Data Record (GDR) products. We demonstrate that the JPL orbit solutions offer an improvement over the standard products, thereby enabling greater radial accuracy of the seal level measurement. However, we also show that the new GDR-F orbit solution standards to be implemented in the GDRs from cycle 95 onward have comparable accuracy to the JPL GPS-based orbit solutions.

Intersatellite Comparisons of Along-Track Statistics



The intersatellite biases for the ionospheric correction from Ku band, SWH from Ku band, and sig0 from Ku band remain near constant between the tandem phase and post-tandem phase at 7 mm, < 5 cm, and 0.30 dB, respectively. The 2.4 cm jump observed in SLA and mean of inter-satellite crossovers is traced to the change in mean sea surface model in Jason-2 GDRs in the LRO. Finally, the average radiometer wet tropospheric correction and wind speed difference biases have increased by 0.9 mm and 0.97 m/s, respectively, between the tandem and post-tandem phases, highlighting a drift in the J2 radiometer.

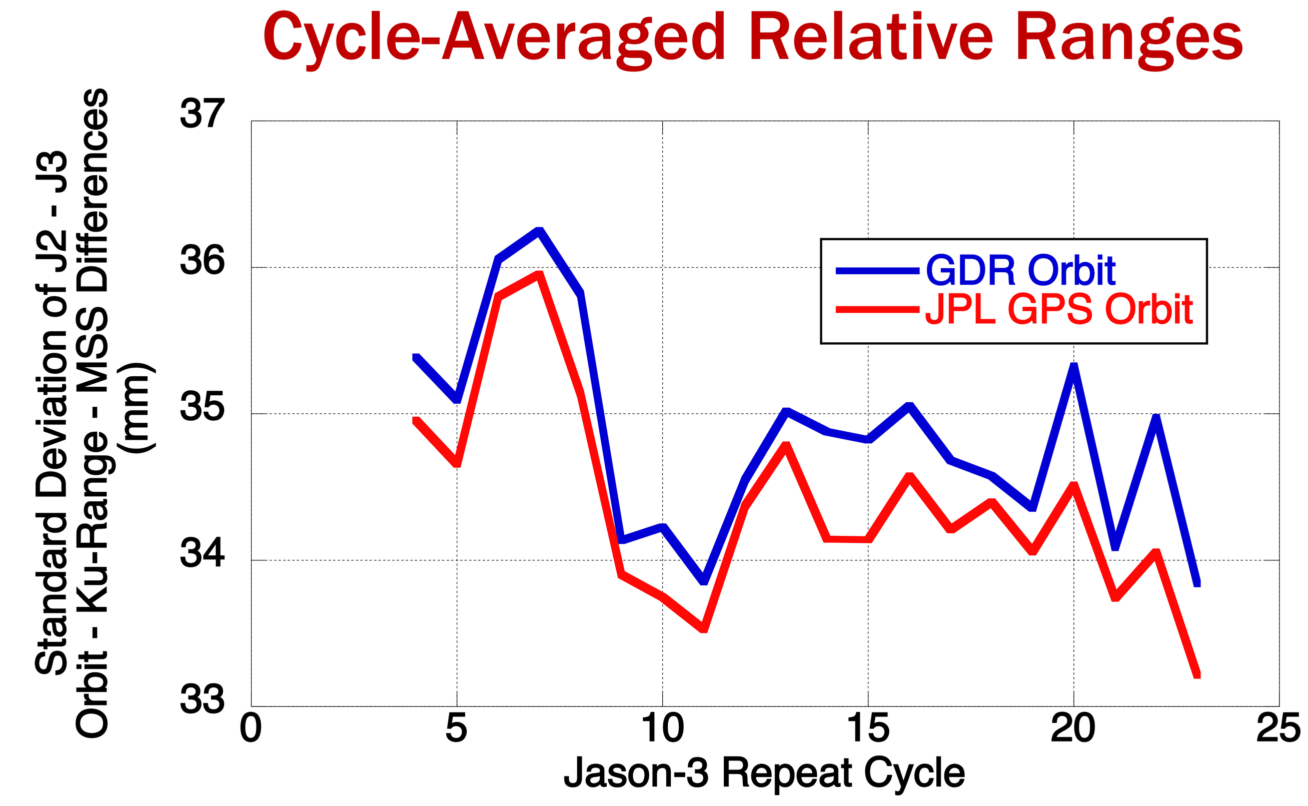




Evaluation of Orbit Solutions

We evaluate the orbit solutions provided in the standard GDR (GDR-E) with two new sets of orbits. First, the JPL orbits are the result of the latest reprocessing of both Jason-2 and Jason-3 GPS-based solutions using the most recent orbit and clock solutions for the GPS constellation in the IGS14 reference frame. Second, the GDR-F solution provided by CNES are the new orbit determination standards to be implemented in the Jason-3 GDRs starting with repeat cycle 95 (see poster from A. Ollivier in POD session).

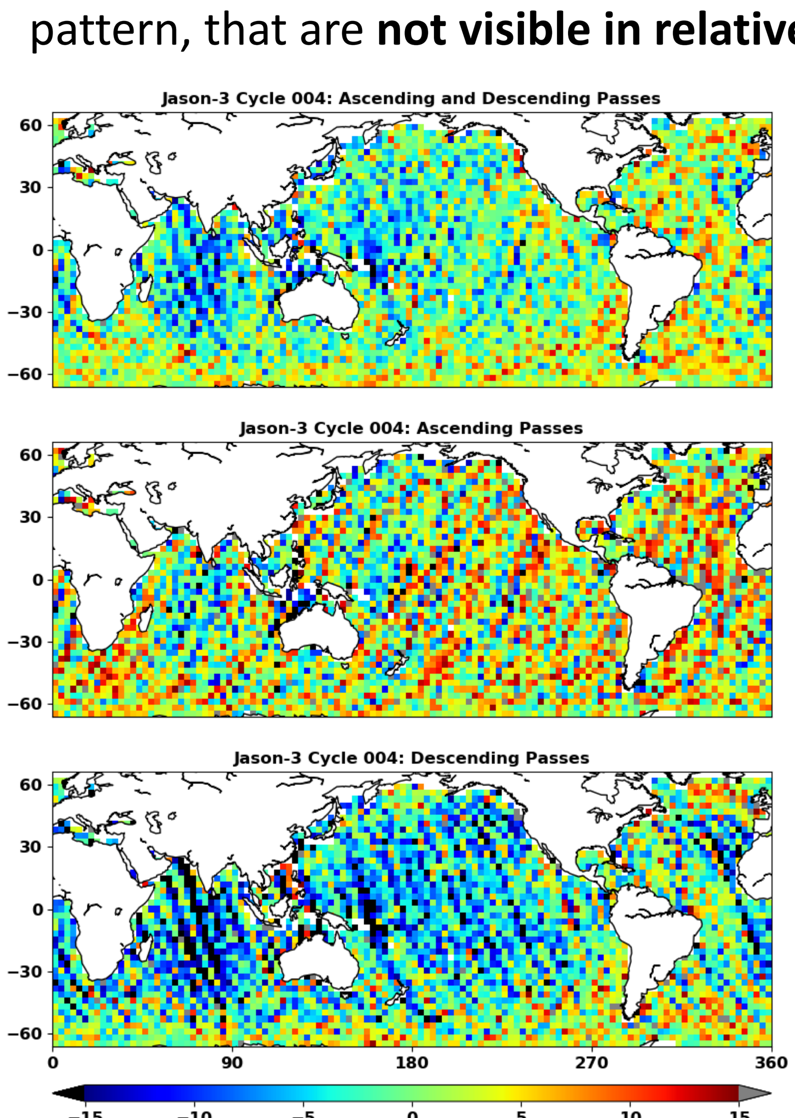
Cycle-Averaged Relative Ranges

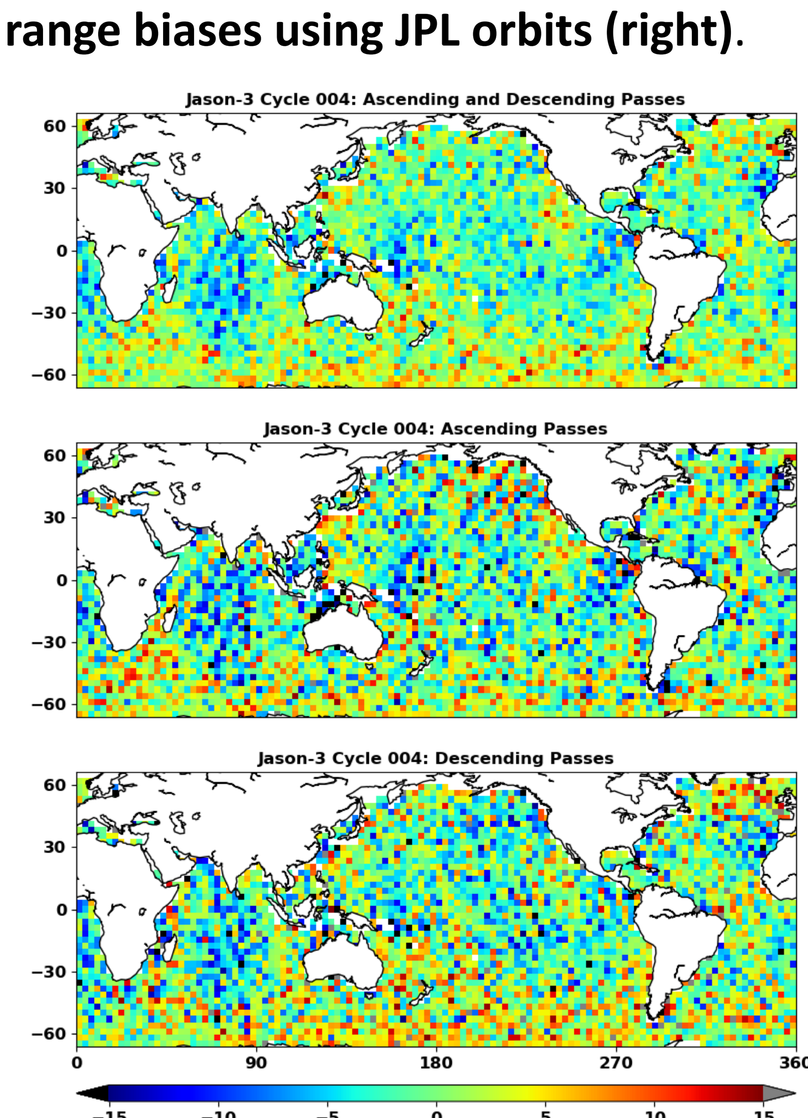


Over the J2-J3 tandem phase, the GDR-E and JPL orbits are used to compute a cycle-averaged standard deviation of Orbit – Range (Ku) – MSS to isolate the variability in the SSH without the influence of other corrections. The plot demonstrates that the **the J2-J3 relative ranges standard deviations are consistently reduced by 0.1 to 1 mm when using the JPL GPS-based orbit solutions**. A similar conclusion is found when examining the C-band range. The higher accuracy of JPL orbits therefore enables a better estimation of the J2-J3 bias.

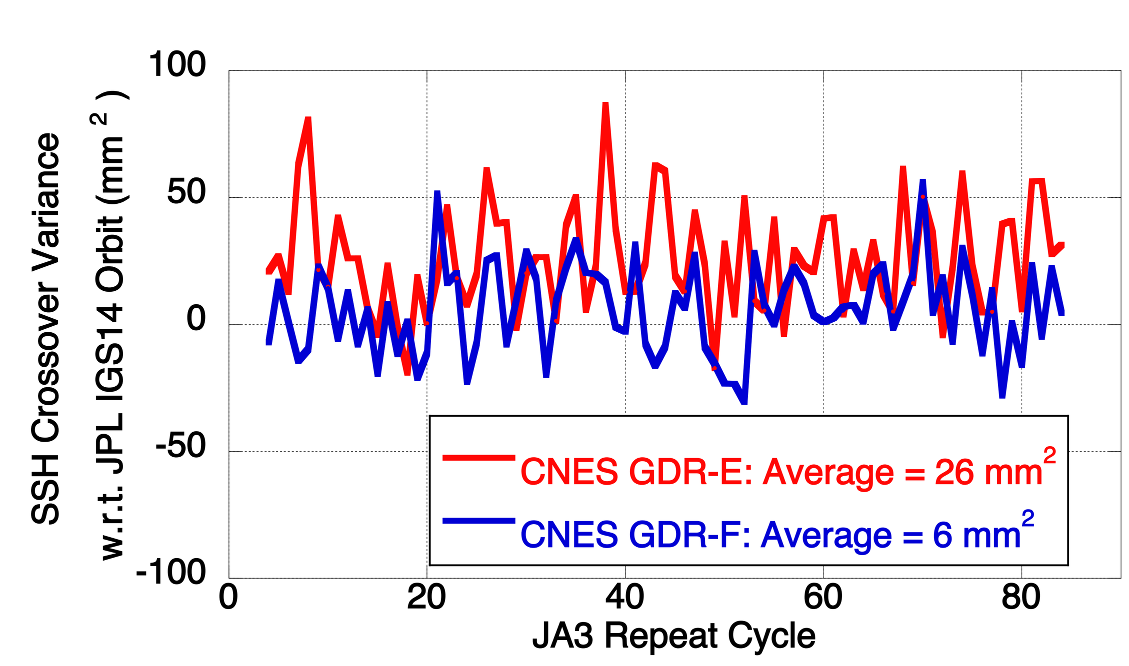
Maps of Relative Range Biases

The difference of relative range biases have distinctly larger magnitudes with the GDR-E orbits (left) and show geographically correlated errors, e.g., W-E pattern, that are **not visible in relative range biases using JPL orbits (right)**.

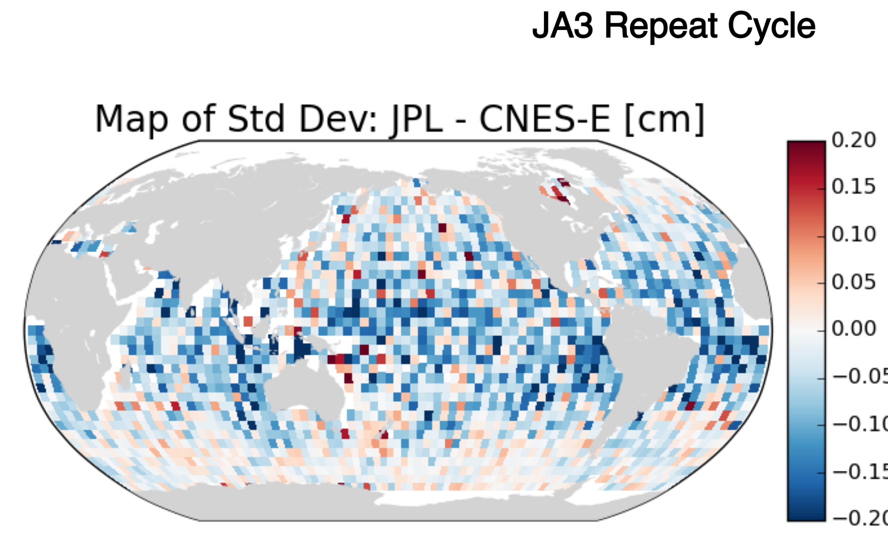


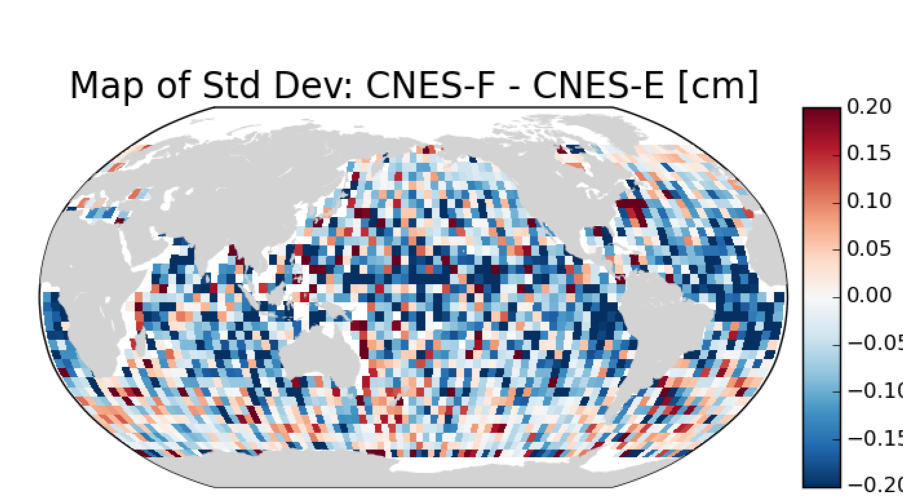


J3 SSH Crossover Variance



Jason-3 internal sea surface height (SSH) crossover variance with CNES GDR-E and GDR-F orbit solutions are subtracted from those with JPL orbit solutions. The differences have an average of 6 and 26 mm² over cycles 4-84. The CNES GDR-F and JPL GPS-based orbit solutions have comparable quality, and both offer an improvement over the GDR-E orbit solutions that are on the cycle 1-94 Jason-3 GDRs.





Maps of differences between crossover standard deviations for cycles 4-85 illustrate that the improvement in orbit for JPL and CNES GDR-F compared to GDR-E is geographically uniform.

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