Regional and Global CAL/VAL for Assembling a Climate Data Record Splinter summary

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Regional Calibration/Validation

Thursday, September 27, 2012

6 oral presentations.

8 poster presentations.

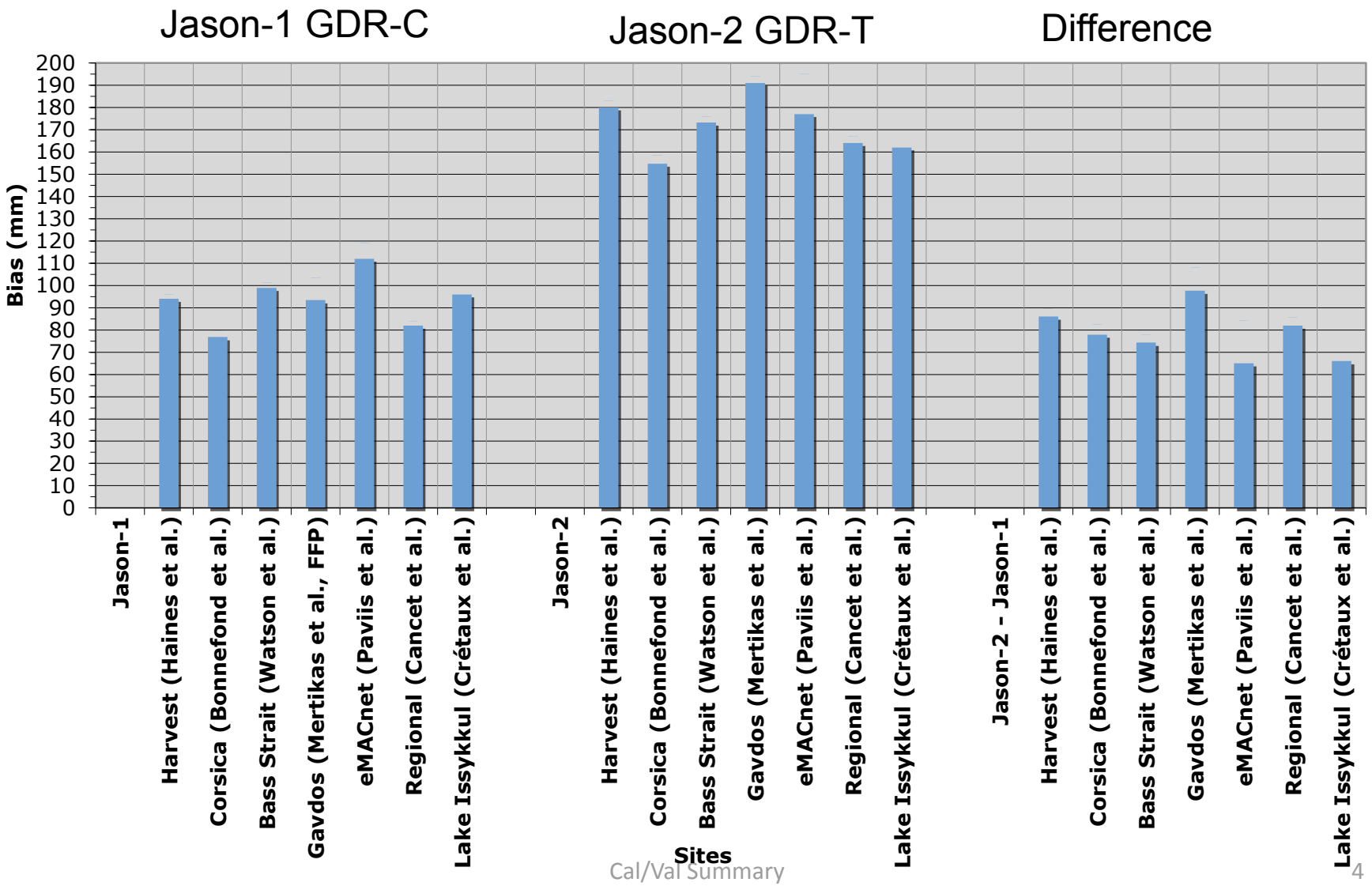
Local Cal/Val summary report

- Good coherence of absolute bias estimates from dedicated sites and also from regional experiments.
  - 10–15 mm rms differences for T/P, Jason-1&2
- Jason-2 SSH bias for GDR-D statistically indistinguishable from zero
  - Consistent picture from Corsica, Harvest and Bass Strait
  - Due primarily to corrections to Ku range (~15 cm bias)
  - SSB correction (GDR-D vs GDR-T) also contributes (~3-cm bias)
- Jason-1 SSH bias for GDR-C ~9 cm
  - New corrections to Jason-1 data (not implemented in GDR-C) expected to reduce bias to insignificance.
- For the first time since the Jason-1 launch, none of the altimeter measurement systems show any unexplained biases.
- Emerging calibration programs (e.g., Gavdos, ACTION, FOAM) routinely delivering results
  - Contribute strongly to refining of bias estimates and characterization of geographically correlated errors, while supporting other missions.

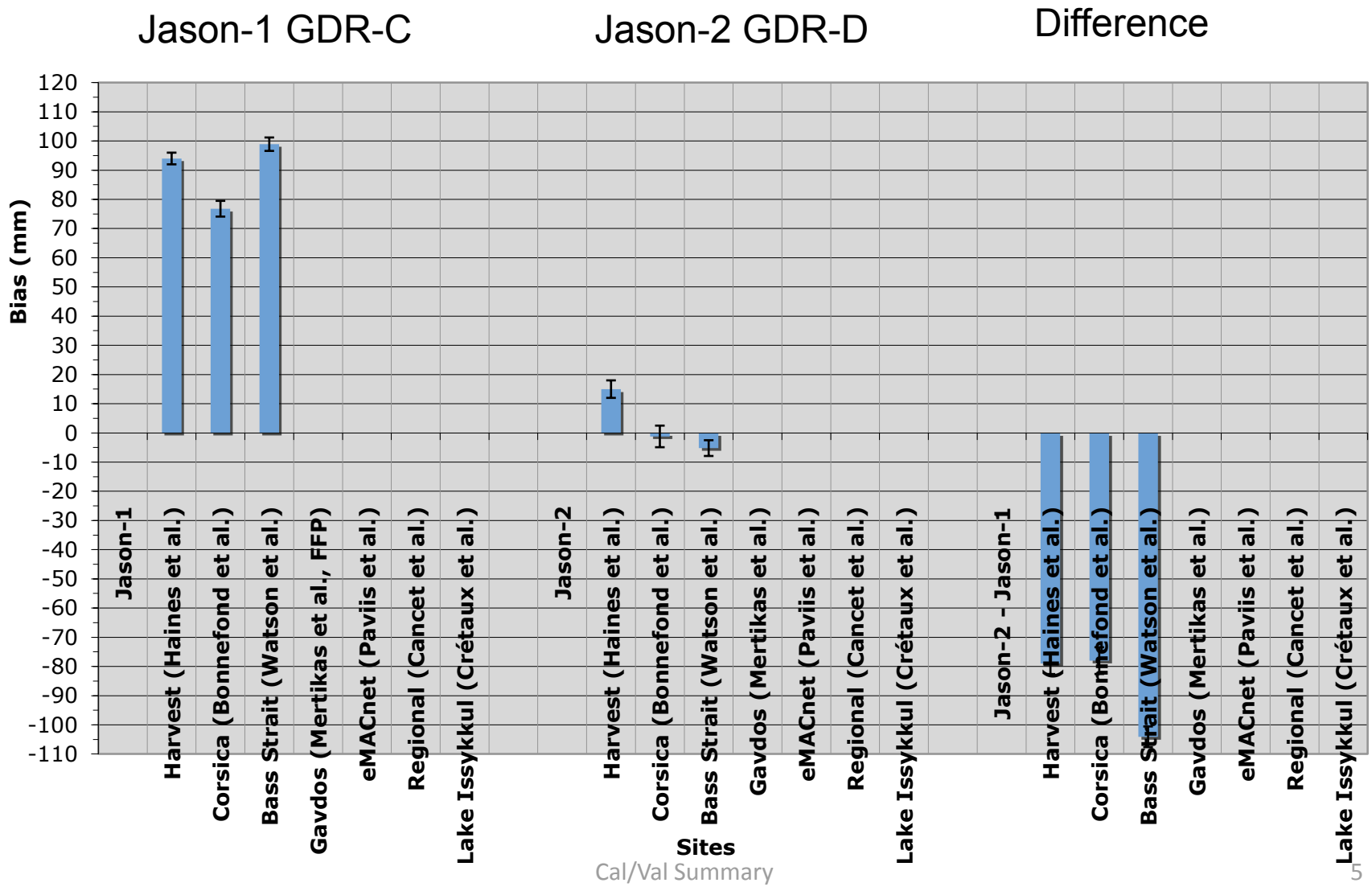
Local Cal/Val summary report

- Enhanced path delay (EPD) corrections continue to prove valuable for (land-contaminated) calibration sites.
- Nominal (MLE4) retracker on Jason-2 GDR-D yields best results at Harvest, Corsica.
  - Higher scatter and ~3 cm upward shift in SSH bias linked to MLE3.
- Transponder deployed at Gavdos yields outstanding (cm-level) repeatability in bias determinations for Jason-2.
  - ~6 cm bias, possibly due to transponder calibration, remains unexplained
  - Further deployments pending.

Absolute SSH Bias Estimates (1/2)



Absolute SSH Bias Estimates (2/2)



Global Calibration/Validation
Thursday, September 27, 2012

9 oral presentations.

8 poster presentation.

Global Cal/Val summary report

- **Jason-2 Mission**
  - GDR, version D reprocessing 70% complete.
  - GDR-D data quality is noticeably better than GDR-T.
    - SSH Crossover variance lower than GDR-T by 200 mm^2.
    - Primarily from improvements in precise orbit ephemeris.
      - Remaining orbit error is < 1 cm, but geographically correlated.
      - Consistency with tide gauge network improves from improved time variable gravity in dynamic orbit solutions.
    - SSH, time tag, ionosphere delay, and wind speed biases resolved through application of:
      - Correct antenna reference point.
      - Improved precision on Pulse Repetition Frequency
      - Sigma0 calibration bias of 0.32 dB to align to Jason-1 and facilitate continued use of Jason-1 wind speed model.
      - Updated sea state bias model
        - » Also improves Jason-1/Jason-2 ionosphere delay consistency).
      - Time tag difference between transmit and receiver times of echos.
    - Climate quality radiometer calibrations for cycles 1-113.
    - MLE3 altimeter data have lower 20Hz noise, but SSH crossover variance is higher on average.
    - MLE3 and MLE4 data provide slightly different regional sea level.
      - Attributable to differences in sea state bias models.

Global Cal/Val summary report

- **Jason-1 Geodetic Mission**
  - Data quality and availability is comparable to repeat mission.
  - Radiometer continues to experience calibration shifts.
    - Unlike Jason-2, calibration updates not performed regularly for GDRs.
  - GDR production resumed in September 2012.
- **ENVISAT Mission**
  - Ended April 8, 2012.
  - Reprocessing continues to improve historical data quality.
    - V2.1 reprocessing completed in January 2012.
      - Showed significant improvements in data quality .
    - Additional upgrades after V2.1 reprocessing continue to improve data quality, especially for climate applications.
      - GDR-D orbit standards
      - Radiometer wet troposphere.
      - New PTR instrument corrections.
    - Improved consistency with Jason-1 and Jason-2.
    - Remaining issues for first year (2003) of data.

Global Cal/Val summary report

- **Cryosat Mission**
  - Retracked Level LRM 1B data show excellent quality.
    - SSH Crossovers with Jason-2 demonstrate slightly better accuracy than Jason-1.
  - Retracked pseudo-LRM 1-Hz data quality comparable to LRM data.
    - Higher levels of 20-hz noise, as expected.
    - No apparent bias with LRM data.
- **HY2-A Mission**
  - Launched August 2011.
  - Evaluation of instrument parameters indicates good data quality at instrument level.
  - Preliminary IGDR data available for evaluation.
    - IGDR data quality has significant potential for improvements.
      - Crossover and sea level anomalies slightly worse than Jason standards.
      - Currently do not represent true instrument data quality.
  - Can provide valuable information for mesoscale variability.
  - Potential for observing sea level.

Global Cal/Val summary report

- **Tide Gauges**
  - Comparisons to Jason-1 and Jason-2 interleaved data produce different stabilities depending on which gauges used.
  - Recent land motion at some sites may be affecting stability estimates.

Cal/Val round-table discussion

The following items were discussed:

How should we ensure the "ground truth" of the tide gauges?

- The tide gauge comparison needs to remain independent of the altimetry measurements. Differences between all tide gauge and the altimeters should be reported to monitor problems with individual gauges. There are site-specific problems. Errors in the gauges are often caught, but with a delay.
- We need to compare techniques to understand differences between different methods.
- A top priority should be to better monitor vertical rates of land motion at the gauges. Should we have a working group to foster quicker communication about the vertical rates? Should we have TIGA at the OSTST meetings to discuss the issues? A major focus of the 5-year plan for GLOSS is to add GPS at more gauges.

Cal/Val round-table discussion

Pros and cons of different types of SAR modes and coverage. What methods and data are needed by Cal/Val team to assess benefits and risks of SAR modes (e.g.during commissioning phase).

- There is no peer-reviewed publication about the SAR, making it difficult to answer the question. The interleaved mode is the only one that will give us the opportunity to cross-compare.
- It is hard to say now what the effect on the global tide gauge comparison will be. The interpretation any differences may be more difficult. Using the interleaved mode everywhere in the ocean and over inland water would reduce the uncertainties in the global mean sea level problem.
- Potential for a bias jump at the boundary between modes.
- What can we say about mean sea level from each mode if the sea state bias is different in the coastal area and the open ocean? Climatic changes in the wind field could affect the sea level climate data record.
- SAR mode provides measurements closer to coast. Need to validate new retracking algorithms for current LRM misions in preparation for cross-comparison with SARM in coastal areas.

Cal/Val round-table discussion

- Radiometers, 1 or 2? How many frequencies?
  - We need wet troposphere measurements to be very accurate and stable in time. Higher frequencies can improve near-coastal wet troposphere measurements. The near-coastal measurements should have the same accuracy as the open ocean.
  - A permanent cold-sky calibration will improve the stability of the radiometer measurements.
- Need for radiometer climate data record? (Once per year update)
- Is there a need for tandem phases between missions (Jason-3, Jason CS), and if so what is the appropriate duration?

Cal/Val round-table discussion

- Is it possible to reduce GDR latency?
  - *Increasing the latency of the GDRs to 6 months could improve the radiometer stability. Reducing the GDR latency could increase the risk of errors.Differences between the IGDR and the GDR are smaller than in the past.*
- Is I useful to provide alternate orbit solution (e.g. JPL GPS-based reduced dynamic) on the GDR?
  - *Is there a strong need from the user community for two orbit solutions?*
  - *The cal/val community has an interest to evaluate differences and has access to other solutions.*
  - *JPL orbits are a research product. To routinely include JPL orbits in the GDR, additional resources would be needed.*
  - *New instrument corrections and different orbit solutions and software could be made available from a single site to evaluate by the OSTST.*
- Is it useful to improve MSL consistency between research groups? (Explain differences to public)