OSTST 2019

Instrument Processing – Measurement and Retracking

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[In spirit: Francois Boy, Robert Cullen, Marco Fornari]

OSTST 2019 Instrument Processing Call

- Understanding the differences between Ka and Ku band backscatter, penetration, volume scattering, rain effects, etc.
- Understanding, exploiting, or mitigating correlations in high-rate (20, 40, or 80 Hz) geophysical retrievals, for example to detect internal waves, reduce correlated noise in the spectral bump, or improve the precision and resolution of altimetric signals.
- Exploiting or mitigating heterogeneous ocean backscatter within the field of view of the altimeter, for example to detect internal waves, manage sigma-0 blooms or very low SWH, edit rain events, etc. Are the answers different for LRM and for SAR?
- Understanding or improving multi-mission inter-calibration issues stemming from the performance of various altimeters and retracking algorithms, including: retracker biases, correlated errors, and the effects of these on sea state bias.
- Understanding the similarities and differences between LRM and SAR altimetry, and the inter-calibration of the two, including: sensitivities to mis-pointing, direction of winds and waves, etc.
- Understanding the similarities and differences between the different SAR altimetry operational (open-burst processing or interleaved vs closed-burst processing) and measurement modes (on board processing RAW or RMC), including: effects of the different modes on fully focused processing, sensitivities to geophysical retrievals if any, Doppler aliasing and its impact, etc.
- Algorithm improvements, including general improvements and also specialized algorithms for particular applications (coastal zone, leads in sea ice, inland water, internal wave detectors, etc.) What can be done and what is gained by it?
- Innovative uses of stack files (“looks” sorted by look angle or Doppler frequency), and how can they best be exploited?
- Does fully-focused processing add significant value? Is there some in-between hybrid processing that optimizes the mix of coherent and incoherent processing? Are there any studies to optimize its computational efficiency?
- What can simulations and empirical studies with existing data tell us about algorithm design or optimal exploitation of future missions? Collection and dissemination of test data sets spanning a large range of conditions.
- What additional data elements should be added to data structures to enhance the accuracy or utility of the data?

Issues from Project Scientists

- 5G Contamination: Concerns have been raised on radio frequency interference from the 5G spectrum on the 23.8 GHz radiometer channel
- Sentinel-3 Stability: What cal/val and instrument processing studies should conducted in advance of Sentinel-6/Jason-CS? Sentinel-3A could be a good testbed for these studies.
- Sentinel-6/Jason-CS Annual Reprocessing:
  - "Annual" reprocessing is planned as part of operations (similar to Sentinel-3 all instruments) triggered by major evolution of processing baseline. Aimed at keeping the S6/JCS products as near to the state-of-the-art as possible.
  - Jason-1 through -3 products may be "left behind" if not updated as well (Jason-2, -3 will be updated to GDR-F), and could break the consistency. **Should these go through more regular reprocessing as well?**
- Jason-3 after Sentinel-6/Jason-CS commissioning: What orbit – interleaved or directly to geodetic? End of life considerations.
- Future of OSTST and meetings: How to advance coastal, hydrology, cryosphere, and ocean altimetry
  - Should the OSTST try a joint meeting with other teams (Argo, SWOT, etc.)? If so, what other groups?
  - Lower carbon footprint

Some Conclusions for Acceptance/Endorsement

- The TOPEX reprocessing effort and the Sentinel3 PTR invetigation show that understanding many details of the instruments is essential to removing drifts and spurious effects. (Scientist question on Sentinel-3 instability)
  - TOPEX instrument and processing effects are now well enough understood to generate a complete new product at GDR-F standard for evaluation for inclusion in the altimeter climate record. (relevant to a Fri plenary talk on status)
- Fully-focused processing is well understood, computationally feasible and should be used to the maximum extent possible.
  - The alignment of quantities (SSH, SWH, sigma0) for each instrument/processing chain to traditional values needs to be validated and documented

Issues for Discussion

- Great progress has been made on understanding water motion effects, but including mitigation in processing will require further work.
- The use of SAR altimeters for ice measurements is promising but needs additional work.
- Sentinel 3A and 3B provide a unique testbed for understanding SAR altimeter measurements. How to use the results in operational processing should be a priority.

- Previous Recommendation: new algorithms need to be tested, documented, test data released, and put out for community comment so they can be incorporated into (re)processing to get the best (and best understood) products – **how are we doing on this?**