Instrument Processing Summary

OSTST 2013 Boulder, Colorado

Francois Boy, Shannon Brown, Phil Callahan, Robert Cullen, Estelle Obligis

October 11, 2013

Wet Tropo Splinter Summary

- **Presentations focused on the performance of the AltiKa radiometer**
  - Two channel (23.8 and 37 GHz) radiometer integrated with the radar
  - < 12 km spatial resolution
- **The TB absolute calibration was assessed using Amazon and Antarctica regions and AMSU-A TBs**
  - Calibration at the ~2K level based on these analyses
  - TBs will be monitored over these regions
- **AltiKa uses Neural Network (NN) path delay retrieval algorithm**
  - Linear transform needs to be applied to AltiKa TBs to make them consistent with the simulations used to train the NN and reduce errors in the PD retrievals
  - Inclusion of AltiKa sigma0 in the algorithm degrades performance with respect to Ku sigma0
  - Version of algorithm that incorporates wind speed (ECMWF) improves performance - Application with altimeter wind speed as soon as available in the product
- **Update to AltiKa attenuation correction algorithm planned to mitigate biases detected**
  - New results more consistent with modeled attenuation values (+0.2 dB bias)

- **2-frequency retrieval algorithm (+sig0) compared to 3-frequency retrieval algorithm for both NN type retrieval and log-linear retrieval (used by Jason series)**
  - Sig0 found to add little value to 2-frequency retrieval algorithm
  - Significantly better performance for a 3-frequency algorithm vs 2-frequency algorithm
  - Addition of SST to 2-frequency algorithm improves result
  - In simulations, NN algorithm performs better than log-linear algorithm

SAR Processing Summary (Tues session)

- Basic processing, retracking of SARM is converging
  - Explore issues of resolution, coherence. Covered in several talks: 80 Hz data; Fourier aliasing; coherence – resolution vs incoherent averaging, noise
  - Understand Doppler aliasing for 9 kHz PRF on Jason-CS
  - Processing can be done to specific ground points; could be especially useful for inland water
  - Pursue improved methods for LRM, P-LRM, and SAR such as reduced WF or leading edge
- Need more users, feedback on full year of CNES SAR product
  - In examining Agulhas current, it was found that ~50% of the velocity came from structures smaller than 50 km
  - It should be remembered that there are still limits on the cross-track resolution of ~8 km, so utility of data, results can be scene dependent
- Sea State Bias model is still needed. What additional data are needed to derive the model?
- What is the process for changing the SAR mask for CryoSat-2 ?
  - Several suggestions for possible changes – Asc/Des pass change; new area(s); but are many considerations – continuity, annual cycles, SSB
- Recommendation for all SARM on Sentinel-3 is technically accepted, but issue of cost (data volume) needs to be worked out
- Recommend that assess user desire for same products from Jason-CS as Sentinel-3, including lower level products

SARAL/AltiKa Status

- Commended CNES for rapid provision of data products to users
- Data appear to be of high quality
- Activities are ongoing to improve retrieval of geophysical quantities – understandable for new sensor at new frequency
- Results are very encouraging for future Ka-band sensors

Possible Discussion Points for the Splinter Sessions

- ✓ (1) Linking past LRM altimetry with existing and future SAR missions.
- (2) Consistency of MSL computed by different groups (Cal/Val splinter output, 2012)
- (3) Thinking about the time phasing of Jason-2/Jason-3 for the interleaved phase (after the Formation Flight Phase)
- ✓ (4) Improvement of SSB: can SAR resolution help? What about differences from LRM, SAR and Ka-band?
- ✓ (5) Monitoring Sigma0 and wind with sufficient accuracy for climate studies
- (6) POD in the case that GRACE is lost? Can it be anticipated?
- ✓ (7) Wet troposphere retrieval: to what extent are observations limited by method as opposed to instrument? Can more models in the CALVAL monitoring and in the products?
- ✓ (8) Jason-1/TOPEX reprocessing?

Discussion of 8 Points (1 of 2)

- (1) Linking LRM and SAR
  - SARM product resolution may need to be optimized depending on target, application – investigate tradeoffs of resolution/precision
  - LRM data are “Fourier aliased” for specular echoes. Remains to be seen whether there is an effect on range for SWH < 1 m? Being studied for Jason-CS by industry/ESA; CNES, NOAA will also study in CryoSat-2.
  - Recommend testing Sentinel-3 processor on CryoSat-2 data to insure robustness for an operational mission
  - (7) Higher resolution data could benefit from higher resolution radiometry, but requires retrieval consistent with resolution.

- (4) Improvement of SSB
  - Need to develop SSB for SARM: a larger data set with wider range of conditions is required. Analysis requires full year of data.
    - Working Group is needed to recommend adjustment to mode mask (within platform and infrastructure constraints)
  - Need to develop SSB for AltiKa – will be done when data are available

Discussion of 8 Points (2 of 2)

- (5) Monitoring Sigma0 and SWH with sufficient accuracy for climate studies
  - Only EnviSat attempted absolute calibration. Others have done alignment.
  - Verify consistency of LRM and SARM sigma0 and SWH (also needed for SSB). Does finer resolution of SARM provide useful information?
  - Jason sigma0 has been shown to be very stable. Monitored through PTR calibration
  - For Ka band need to include stability of attenuation correction
  - Work with scatterometer and modeling communities so that data are used, especially for high resolution

- (7) Wet Troposphere
  - A higher frequency radiometer could improve retrievals. Cross-calibrate with AMR
  - Higher frequency can provide correction over land
  - Processing to reduce land effects to improve coastal, hydrology uses
  - Investigate unified altimeter, radiometer algorithm to retrieve path delay, attenuation (including liquid), wind speed