Instrument Processing Measurement and Retracking

Summary

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Summary LR and Calibrations

Some efforts are still on-going with the calibration and the retracking of LRM echoes especially to improve Sentinel-6 data.

Sentinel-6 C-band data present significant differences when compared with Jason-3. These differences are believed to originate with Sentinel-6 not Jason-3. Sentinel-6 C-band is noisier than for Jason-3 which makes it more challenging to process. However, algorithm changes could mitigate this. In particular, the implementation of a numerical MLE-2 retracker (JD Desjonquères), suppressing the Significant Wave Height C-band estimation, could improve both the noise level and agreement with Jason-3.

Using an appropriate noise model, the FastAdaptive retracking (Anna Mangilli et al.) would provide an optimized solution for Sentinel-6 LRM echoes processing. It is also a numerical retracker and therefore takes into account the altimeter Point Target Response and over all would be beneficial to the Sentinel-6 mission. It would ensure a good stability thanks to the use of the PTR and would not be affected by the high Pulse Repetition Frequency generating some pulse-to-pulse correlation for the LRM echoes. The FastAdaptive algorithm, while slower than the current operational numerical retracker is computationally efficient and it should be compatible with the development of a medium-term operational processor (i.e., a few years from now).

Results from the altimeter calibrations for the Copernicus altimetry missions (Pablo García et al.) demonstrate compliance with mission requirements. Parameter evolution can be different from a mission to another one but without impact on data after calibration compensation. In particular, the slope of the power drop for Sentinel-6 at the beginning of the mission was higher than for previous missions, but it has decreased since then and has no detected impact on the derived geophysical estimations. In theory the cal-1 could be used for providing calibrated echoes after correction (echo deconvolution) from the altimeter Point Target Response. Such an approach could possibly ease the retracking. However, the deconvolution of real echoes has proved to be difficult in the past and cannot be used for LRM echoes .

Summary SAR:

More and more applications emerge from the use of Fully-Focused SAR on the Sentinel-6MF mission. T. Moreau et al. presented an optimal configuration of this processing and a list of applications
- In hydrology, exploiting the 2D FFSAR radargram, it is now possible to identify the river's features emerging as bright curves from the darker surroundings and it appears possible to retrieve water surface height even when the river is observed off-nadir (JD Desjonquères et al & JA Daguzé et al in poster session, F. Boy et al – hydrology session).
- In open-ocean, swell waves signature are observed as amplitude modulation in the FF-SAR radargram that can be used to derive 2D spectra featuring characteristics such as period, amplitude and direction of the swell waves [Altiparmaki et al., 2022]. This year, Altiparmaki et al exploited the so-called azimuth cutoff in SAR altimetry to determine the vertical velocity variance of the ocean surface under moderate conditions. Then, M. Kleinherenbrink et al presented an extension of the Altiparmaki et al work. Cross-spectral analysis is studied to remove at least two of the four spectral ambiguities.
- Regarding sea ice leads, T. Moreau showed another example of possible applications using FFSAR. S6-MF imagery processing can provide valuable information on lead/floe detection and coverage.

C. Buchhaupt proposed a new numerical stack retracker scheme adapted for sea-ice surfaces for the Sentinel-3 UFSAR mode. He demonstrates an improvement of the backscattering power function to match sea-ice signals.