SARAL/AltiKa altimeter data over open ocean, coastal zones and inland waters: the PEACHI project

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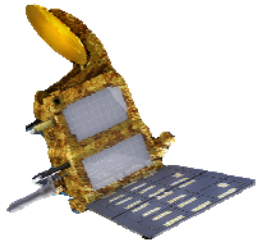


OVERVIEW

PEACHI: Prototype for Expertise on AltiKa for Coastal Hydrology and Ice

- ❑ CNES initiative to provide experimental improvements of Ka altimeter measurements in open ocean, coastal areas, but also in continental and sea ice domains
- ❑ It aims at improving the reliability, the accuracy and the precision of the geophysical parameters with new or better algorithms
- ❑ Preliminary results of the improvements on retracking algorithms and radiometer correction in coastal zones

MAIN OBJECTIVES OF PEACHI

- ➢ Definition and implementation of a software prototype for analyzing and improving dedicated processings relative to the SARAL mission
- ➢ Analyse, tuning and validation of the existing algorithms before their application in the operationnal products
- ➢ New algorithms and parametrisation implemented during the exploitation phase
- ➢ Seamless transition with the existing altimeter products and algorithms

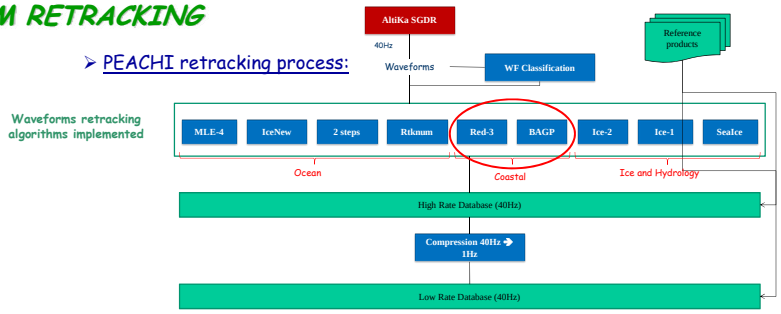
WAVEFORM RETRACKING

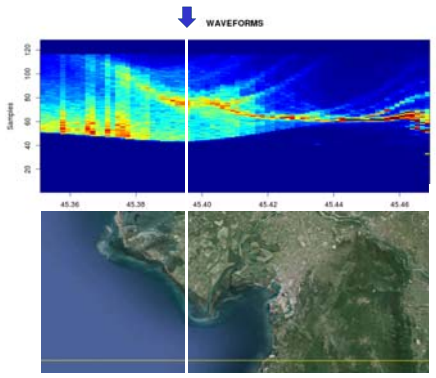
➢ Coastal altimeter waveforms are highly corrupted by emerged lands or modification of the sea state close to the coast and thus require dedicated retracking algorithms

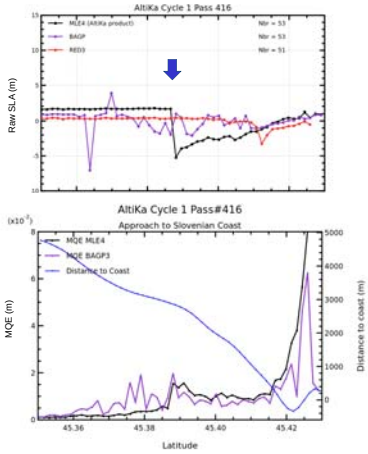
➢ Computation of 2 dedicated retrackings in coastal areas:

- ❑ Red3: MLE3 retracking restricted to a portion of the echo defined by the waveform classification flag
- ❑ BAGP: MLE3 retracking taking into account a gaussian peak (land contamination) corrupting a brownian waveform

➢ PEACHI retracking process:







➢ In this example (Cycle 1/Pass 416 in median tracker mode close to Slovenia, approaching coast), the waveforms present a double leading edge from latitude 45.38 deg, which is probably due to important differences of the sea surface roughness in the successive waveform footprints (left figure)

➢ The MLE4 retracking algorithm adjusts a Brown model to the waveforms until a second peak of energy is present on the trailing edge. Then, it doesn't succeed in maintaining the fitted model on the first leading edge, introducing a huge bias in the range estimation (top right figure)

➢ Compared to the MLE4, the BAGP continuously retracks the correct leading edge of the waveform, even when a second front is present. We observe a continuity in the range estimation (no jump) even if we have to notice that the retracked range is obtained with an important noise level (top right figure)

➢ Moreover, the Red3 algorithm also yields attractive results. Indeed, reducing the retracking estimation window leads to longer focus on the leading edge of the waveform and prevents from early land corruption (top right figure)

➢ In addition, the mean quadratic error (MQE), which quantifies the retracking performance, confirms this results: when a peak pollutes the waveform, the BAGP MQE is better than the MLE4 one (bottom right figure)

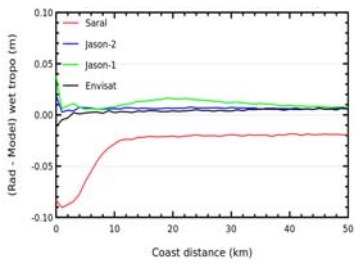
WET TROPOSPHERIC CORRECTION

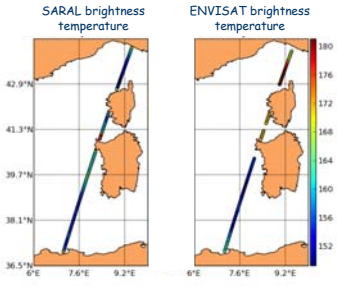
➢ The contamination of coastal measurements depends on the spatial resolution: compared to other altimeter missions, AltiKa radiometer has the finest resolution (8 km to 12 km depending on channel)

➢ No dedicated processing is applied on coastal approach for AltiKa radiometer: the wet tropospheric correction shows no contamination up to 10 km from the coast (left figure)

➢ Compared to Envisat, AltiKa radiometer provides a larger number of measurements in coastal areas (right figure)

➢ Moreover, on the 0-10 km coastal area, *the Envisat method* (extrapolation of the last valid value over ocean) will be considered to provide relevant brightness temperatures up to the coast





FUTURE

- ❑ **Analyses of altimeter measurements over ice regions (continental and sea ice):**
  - ➢ Assessment of the retracking algorithms depending on surface ice type
  - ➢ New processing for the determination of the SSH over ice regions
- ❑ **Altimetry:**
  - ➢ Analyses on better observations of small mesoscale (50-100 km)
  - ➢ Ku/Ka sigma naught comparisons (over ocean and ice)
- ❑ **Radiometry:**
  - ➢ Impact of roughness in the neuronal inversion
  - ➢ Computation of a coastal wet troposphere correction
- ❑ **Tide model:**
  - ➢ New release of the FES model (expected mid 2014)

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