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Improving sea level record in arctic using ENVISAT altimeter measurements

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The Arctic is an important component of the climate system whose exact influence on ocean circulation is still poorly understood today. This region is also very sensitive to global warming and some direct consequences like melting ice are particularly visible. In this context, extending the knowledge of the sea level variability as far as possible in the Arctic Ocean is a valuable contribution to the understanding of rapid changes occurring in this region. Due to a particularly complex and unstable environment, ocean observation is challenging considering that sea level measurements can be widely corrupted by the presence of sea ice in the altimeter footprint.

In the framework of the ESA Sea Level Climate Change Initiative project, new algorithms have been developed and implemented to process 10 years of ENVISAT altimeter data over the Arctic Ocean and to improve the sea level measurement in this region. The new processing chain contains three main steps. The first task consists in identifying altimetric returns for which a standard proven estimation processing may be used, and in flagging those requiring more sophisticated processing. This will include introducing a novel approach that uses the relationship with neighbouring waveforms to aid in the identification of key reflecting surfaces. The second task consists in applying estimators that performs better in situations where sea-ice covers partially or totally the observed surface. The last task consists in investigating the transition zones to make sure that no artificial discontinuities are introduced by the different processing and to reduce these discontinuities.

We propose in this talk, to explain and illustrate the different steps of this study and to show important figures of improvement regarding the estimation of sea level variability in the Arctic Ocean.