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Although conventional radar altimetry products (Jason1, Jason2, LRM CRYOSAT2, etc) have a spatial resolution as high as 300 m, the observation of ocean scales smaller than 100 km is limited by the existence of a “spectral hump”, i.e. a geographically coherent error. In the frame of the future altimetry missions (SAR for Cryosat -2 and Sentinel-3 missions and interferometry for the SWOT mission) it becomes crucial to investigate and to better understand the signals obtained at small scales by conventional altimeter missions.
We show by simulation that heterogeneous backscattering scenes can result in the corruption of the altimeter waveforms and retracked parameters. The retrackers used in current ground processors cannot well fit the Brown model during backscattering events because this model has been designed for a homogeneous scene. The error is also propagated along-track because of the size and shape of the low resolution mode (LRM) disc-shaped footprint.
On real data, the hump phenomenon is shown to be almost ubiquitous in the ocean, yet more intense at low latitudes and in the Indian Ocean and Western Pacific Ocean, where backscattering events are more frequent. Its overall signature could be a Gaussian-like random signal smooth for wavelengths smaller than 15 km, i.e. white noise on 1 Hz products.
The analysis of current data from 8 altimetry missions (ERS-1/2, ENVISAT, JASON-1, JASON-2, CRYOSAT-2, SARAL and HY-2) highlights the influence of the instrument design and altitude, and the influence of the retracker used. The spectral hump is a systematic response to random events and it is possible to mitigate it with new processing.
Simulations and geographically limited datasets from the synthetic aperture radar mode (SARM) of Cryosat-2 show that the thin stripe-shaped synthetic footprint of SARM might be less sensitive to the artifact.
OSTS session
Quantifying Errors and Uncertainties in Altimetry Data