Introduction

The present study is based on user products and data by analysing the high frequency (HF) part of the Sea Surface Height (SSH) signal of Jason-1, Envisat and Topex. The signal includes instrumental noise, processing noise, correction noise, residual geophysical signals. Comparing the HF content of several missions enables to compare the performances but also to better understand the physical content of each signal. Two types of methods have been used to analyse such a signal: a spectral analysis, and a filtering technique. The first method allows us to quantify accurately the global SSH-HF for 1Hz and 20Hz data. The second method is used here to characterise the geographical distribution of this HF signal at 1Hz.

Characterisation methods of the HF content

Spectral analysis

A plateau on a power spectrum can be the signature of a white noise. The standard deviation of its distribution can be obtained by:

$$\sigma = \sqrt{\frac{\alpha}{2}}$$

- Plateau on power spectrum
- Signal hidden by noise
- Variance difference of HF content: $\sigma_{HF(SLA)}$ in 2°x2° boxes RGdr)

Filtering technique

Using a filtering technique allows us to keep the geographical distribution of the high frequency content for Envisat and Jason-1 over cycles 128-135. The consistency between Envisat and Jason-1 is especially improved in wet areas.

Data

- 20Hz and 1Hz Envisat/Jason-1 comparison is performed over the periods 7-8 and 7-26 September 2006. (Jason-1 GdrA and B)
- 1Hz Topex/Jason-1 comparison is performed over the period 22 July-1 August 2002 (Jason-1 GdrB and Topex RGdr)

Analysis of the high frequency content of Jason-1, Topex and Envisat data

Improvement of consistency EN / J1 with GdrB

Here, 1Hz and 20Hz Envisat and Jason-1 are selected to separate SSH by classes of wave height.

- At 1Hz the noise level increased logically with the wave height. Envisat and Jason-1 1Hz spectra are superimposed for high wave heights.
- At 20Hz the Jason-1 spectra are closer for small waves (plateau almost superimposed) than for high ones.
- Contrary to the wave selection, the mispointing selection removes a very low amount of points.
- At 1Hz the Envisat and Jason-1 are consistent in both cases. For the two satellites, the HF energy level is also very sensitive to the mispointing selection.

Impact of SWH on HF spectra

- The energy in the 0.1-0.4 Hz bandwidth increases with the waves. The pseudo-plateau visible at 1Hz on high waves is not the signature of an instrumental white noise. It is the signature of the energy between 0.1-0.4Hz on the 20Hz spectra.

Impact of Mispointing on HF spectra

- Contrary to the wave selection, the mispointing selection removes a very low amount of points.
- At 20Hz the plateaux is not impacted by the selection on both satellites. However, the energy between 0.1-0.4Hz is strongly reduced when selecting low mispointing.

Conclusions

Cross comparison between Jason-1 and Envisat HF content

- The energy at 0.1-0.4Hz is reduced with the use of MLE4 on Jason-1 and 20Hz, GdrB enables to improve the Envisat/Jason-1 consistency at 1Hz and 20Hz.
- BUT some differences remain:
  - There is a remaining suspicious high energy in the 0.1-0.4Hz bandwidth on 1Hz spectra
  - The perfect superimposition of 1Hz Envisat and Jason-1 spectra is in contradiction with the lower energy on Jason-1 20Hz spectrum
  - At 20Hz, in the case of small waves selection, the energy is reduced at all frequencies whereas only the remaining energy in the bandwidth 0.1-0.4Hz is reduced in the case of the low mispointing selection
  - The remaining suspicious high energy in the 0.1-0.4Hz bandwidth is due to perturbed data with high mispointing values
  - The pseudo-plateau visible at 1Hz on high waves is not the signature of an instrumental white noise. It is linked to the energy between 0.1-0.4Hz on the 20Hz spectra

First results on the cross comparison of Jason-Land Topex RDR HF content

Good consistency between Topex LSE and Jason-1 MLE4