

WP 3 – Sea state error budgets, Features, Detectability

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Questions:

1. Is the accuracy of present data on sea state sufficient for practical purposes?
2. How is a denser cluster of satellite, hence data, going to affect the accuracy of the practical results?
3. Is there any other information that can be extracted from an altimeter?
4. Are there special areas where attention should be focused?

1) The accuracy of the present data on significant wave height and wind speed is good on the average. It can be estimated at
Hs 0.5 m or 5% of Hs, whichever the larger,
U10 2 m/s

These figures are reasonable good. However, problems exist in the very low and high value ranges. Particularly the latter one is of strong interest for all the practical applications.

2) Taking ECMWF as an example, presently only Hs data are assimilated into the operational model. The U10 values derived from altimeter are saved for an independent evaluation of the performance of the meteorological model. This is obviously connected to the use of other sources of information on the surface wind fields, e.g. scatterometer data.

The larger the amount of information on Hs, the stronger the impact on wave model results. This information has no particular restriction in time and space, provided it is sufficiently evenly distributed.

A strong limitation comes from the lack of information on the wave spectrum (see later). Hence the correction on the Hs field is done using the available information on the local spectral shape, as provided by the wave model. Because wind waves are extremely sensitive to the local wind speed and direction, this added information can be rapidly lost if the local wind field is not correct.

3) A partial solution to the above problem is to provide information also on the wave period, which has been proved possible..

A further, essential step would be to provide estimates of the 2-d wave spectrum, i.e. of the distribution of energy in wave number space (i.e. in frequency and direction). The technique has been proved feasible for a low flying plane, using a standard nadir looking beam and a rotating inclined one. Studies are under way to extend this technique to satellite altimeter via suitable modification of the apparatus.

4) The present global meteorological and wave models often fail in the evaluation of the extreme results. This is connected both to a lack of resolution of the models and to a lack of information. It is not possible to anticipate where an extreme will appear, but it is clear that a dense network of satellites will have proportionally better chances to cross areas of extreme wind speeds and wave heights.

While the present accuracy of the meteorological and wave models is reasonably good in the open oceans, we cannot forget that most of the economical interests in the sea are focused in the coastal zone. This is also the area where the models show the largest errors. This is also the area where altimeter data are more required to improve the model performance.