WAVE HEIGHT MEASUREMENTS FROM ALTIMETERS: VALIDATION STATUS & APPLICATIONS

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From ERS-1 to Jason-2, twenty years of altimeter wave height measurements are available. For an easier access to these multi-altimeter data, a simplified homogeneous data base was developed. See ftp://ftp.ifremer.fr/ifremer/cersat/products/swath/altimeters/waves

The goal is to gather, in the same format, significant wave height (SWH) and wind speed measurements from the various altimeters and space agencies in order to construct homogeneously validated and calibrated data sets. This work is also a contribution to the ESA GLOBWAVE project www.globwave.org

Validation and calibration of altimeter wave height measurements are regularly updated. Recent results are presented for in-flight altimeters Jason 1&2, ENVISAT and ERS-2 (Rough ERS-2 mission ended in July 2011).

ERS-2 1 Hz altimeter SWH mean bias is larger: mean 14 cm; 24 cm standard deviation. The negative bias increases significantly with SWH. The monthly mean bias is very steady along the whole mission.

The maximum 1 Hz altimeter SWH was measured to 18.1 m by ENVISAT on 13 February (left), and to 20.1 m by Jason-2 on 14 February (right). This is the highest consistent altimeter swell ever measured. Such high altimeter SWH values have never been validated at along track consistency (i.e. no jump or anomaly) suggests a real feasibility. Note that the 1 Hz standard deviation of measurements was 1.5 m for the Jason-2 maximum SWH of 20.1 m.

Along-track altimeter SWH are reported (black) on middle panels for ENVISAT and Jason-2, together with WaveWatch-III model output using ECMWF (red), NCEP (green), or 10h increased NCEP (blue) winds, indicating some difficulty in modelling such high sea states.

The two bottom panels present along-track interpolated wind speed from ASCAT, OCEANSAAT, altimeter, radiometer and NCEP.

Extreme sea states were observed over the North Atlantic Ocean in February 2001. During nine consecutive days (February 7 to 15) the along-track significant wave height measurements from available satellite altimeters (ERS-2, ENVISAT, Jason-1 and Jason-2) were larger than 12 meters over many wide areas included in a larger global region defined by 50°W-10°W in longitude and 40°N-60°N in latitude.

Afternoon ERS-2 and Jason-2 radial interferograms along a common track were processed (green and red, respectively) and used to produce a new dataset called ERS-2 ENVISAT Jason-2 updated Mission product via an interferometric processing approach. The total data set includes 76 along track interferograms, from February 15 to March 15, 2001 and covers an area from 30°S to 60°N.

The two upper maps above show the improvement of the normalized rms error between model and altimeters in southern oceans when modelling the icing impact. Bottom map shows maximum values of differences rising to almost 1 m, over large southern ocean areas.

Note the opposite sign biases of ENVISAT version V1 and V2

OBSERVATION OF PHENOMENAL SEA STATES IN NORTH ATLANTIC STORMS FEBRUARY 2001 (see also Jenny Handelf at poster this session)

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Almost similar wind patterns are revealed by the QuikScat data (right) in the Southern Pacific. The correlation between wind and wave anomaly patterns is lower in the Atlantic and in the Eastern subtropical North Pacific, which could be due to the relative level of wind sea and swell according to the region.

REFERENCES


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