

A Coordinated Programme for Calibration, Validation and Assimilation of Altimeter Wind Wave data

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CALVAL PROGRAMME:

Main Objectives:

- to Calibrate/Validate JASON Fast delivery and Offline GDR wind and wave data sets through comparison with:
 - buoys available on the Global Transmitting System
 - Satellites
 - Numerical Weather Predictions models and Numerical Sea-State Prediction s models.

Location:

Comparisons will be done at global scale but also at locations of campaign experiments (Mainly in the Mediterranean Sea)

AVAILABLE MODEL DATA:

WINDS

Winds from Three Numerical Weather Prediction (NWP) models will be used for the Calibration/validation of the wind measurements:

- IFS/ECMWF (0.5°)
- ARPEGE (0.25-1.5°)
- ALADIN (0.1°)

WAVES

Sea-States from 2G and 3G models operated at Meteo-France and ECMWF will be used for the calibration and the validation of the wave measurements:

- WAM
- VAG

In addition, a dedicated fine resolution VAG model has been implemented on the Western Mediterranean sea

WAVE MODELLING:

Two operational wave models covering the Mediterranean Sea will be used for the validation of the altimeter data.

WAM (ECMWF) has a resolution of 0.25° grid and is driven by the ECMWF winds.

VAG (Meteo France) has a resolution of 0.25° and is driven by the winds from the ARPEGE model. In order to provide a model with a higher resolution, VAG is run on a grid covering the western Mediterranean sea with a spatial resolution of 0.083° and is driven with the ALADIN winds available on a grid of 0.1° resolution every 3h.

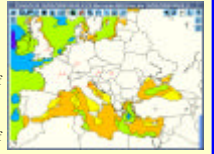


Figure 1- Map of significant wave height from the regional wave model VAG operated by Meteo-France.

METHODOLOGY

On receipt of first cycle of data

- Compile statistics of data flags, and distributions of H_s , σ , $U10$; (corrections and standard)
- Initial test of supplied data flags, assess use of further tests
- Comparisons with NWP model analyses (Hs and U10)

With first 1 month's data, then every 3 months

- Further test of supplied data flags, through co-located buoy data
- Extract co-located altimeter and buoy wind/wave data, where possible, put on ftp/WWW site.
- Establish accuracy (absolute and relative) of JASON wind/wave parameters, through orthogonal distance regression procedures.
- Compare to TOPEX, ERS-2, GFO and ENVISAT results
- Identify any significant problems with JASON data and make recommendations to CALVAL team.

EXPECTED OUTPUTS

• First 10 day Data Cycle:

Verification of data format, assessment of data flagging. Recommendation of further quality tests.

• First 3 x 10 day Data Cycles (1 month):

Preliminary assessment of accuracy of JASON wind/wave data. Identification of any major early problems with product.

• First 9 x 10 day cycles (3 months):

Full assessment of validity of wind/wave product. Confirmation that product meets specification. Assessment based on projected minimum 100 altimeter/buoy co-locations.

• First 18 x 10 day cycles (6 months):

Assessment of accuracy (calibration corrections, and rms error) of wind/wave product from altimeter/buoy co-locations. Initial recommendation of any calibration corrections. Comparison of JASON product with TOPEX, GFO and ERS/ENVISAT through co-locations and distribution functions.

Assessment based on projected minimum 200 altimeter/buoy collocations.

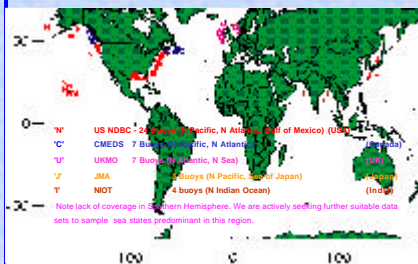


Figure 6. Location of buoys that will be used for the calval programme

Figure 4. Example of validation for wave height and wind speed; Satellite versus Buoys.

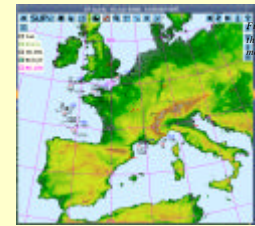
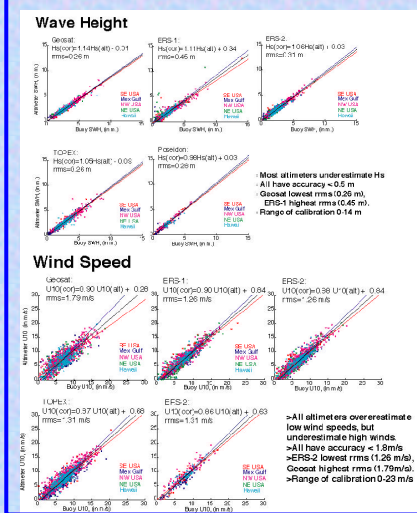


Figure 2. domain of the limited area model ALADIN

Figure 3. Map of significant wave height from the global 3G wave model WAM run at ECMWF.

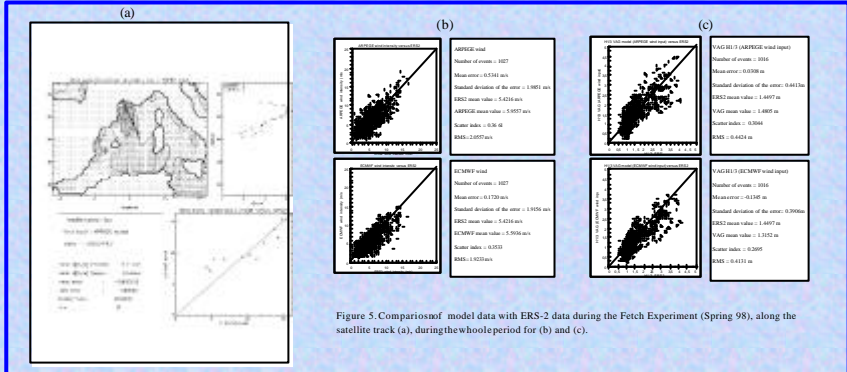
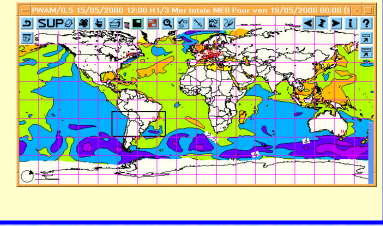


Figure 5. Comparison of model data with ERS-2 data during the Fetch Experiment (Spring 98), along the satellite track (a), during the whole period for (b) and (c).

Figure 7. Mean difference between the SWH fields obtained with and without assimilation of ERS2 altimeter data during a two months period on the North Atlantic.

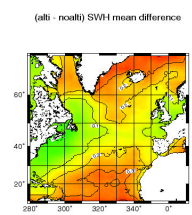
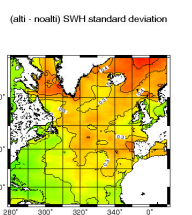


Figure 8. Root mean square difference between the SWH fields obtained with and without assimilation of ERS2 altimeter data during a two months period on the North Atlantic.



Associated Scientific Investigations

- **Performance of new wind speed algorithms.** Investigate dependencies on state of development of sea, nature of wave spectrum.
- **Further development and testing of wave period algorithm.** Test for dependence on state of development of sea, presence of swell. Determine limits for useful applications.
- **Wave Climate Variability** JASON data will be included in the multi-satellite wave climatology for use in studies into large scale wave climate variability.
- **Wave data Assimilation** JASON data will be assimilated in a global numerical sea state prediction model. The impact of the data on the forecast will be investigated. Different methods will be tested (Use of the wind speed to discriminate the wind sea part in the wave spectrum).

Comments

- The same procedures will be used for ENVISAT, and are being used on Geosat Follow-On data, to ensure consistency across all altimeter wind/wave data
- During the cal/val campaign, METEO-FRANCE will provide pressure, wind and significant wave fields from the NWP models ALADIN (0.1°X0.1°) and VAG every 3 hours for the Western Mediterranean