**Experience of Applications of Near Real Time JASON wave and wind data.**

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**ABSTRACT**

Perhaps the most usual application of Near Real Time (NRT) satellite altimeter wind and wave data is through assimilation into wave models (NRT) data from measurement to application of sea state 3 hours. However, a number of users have a requirement to receive satellite wind and wave data at a faster rate. This allows the user to compare directly these data with other sources of information that they possess, and so to come to some decision or response to their own requirements. Satellite Observing Systems (SOS) currently receive and process JASON NRT-Jason data through 8am (and, intermittently, though the GLACE/SCAR satellite, too), and is now carrying out a number of the applications of these datasets. In this presentation we provide an overview of some of those applications.

**State of the Art**

In this demonstration application, near-real time JASON significant wave height quickly are quality controlled, calibrated and then made available to the user in a form appropriate to the current time. The combined datasets are available in gridded or best form. Users can then assess the accuracy of the wave model output, judge how well the model output represented the real ocean, and then make appropriate comparisons to other sources of information. The data is now operating in the coastal, and deep ocean environments, and from here the data is available in the long LBG LGAbers. It will also review a severe event experienced off the North West coast of Scotland in January 2000, and consider how availability of altimeter wind data could have contributed to the decision making process.

**MISSEC - Marine information for Security**

MISSEC is a UK project designed to extend existing technology by integrating near-real time satellite observations and EO-based data into electronic charting systems for potential users in the Marine Security sector. The MISSEC team will integrate EO data from JASON and other satellites with foundation data such as charts, marine and background statistical information and investigate their potential value in support of Marine Security interests and operations and planning by the Ministry of Defence, the Royal Navy and UK Hydrographic Office.

**COASTWATCH**

Access of the ESA GMES Services (Elements) COASTWATCH project, is SOS providing near real-time wave information to CEFAS (Centre for Environment, Fisheries and Aquaculture Science), for evaluation and subsequent inclusion in their WaveWatch monitoring system. The WaveWatch system is a strategic initiative to provide near real-time coastal wave data for tidal, Coastal Managers and other stakeholders in England and Wales. It consists of a network of buoys, and support from terrestrial models, but to use our data, satellite data have been included.

**MISEC - Marine Information for Security (Coeurty)**

MISEC, for Marine Information for Security, is a project funded by the British National Space Centre. It began in June 2003 and runs until March 2006. The broad objective of MISEC is to investigate the integration of EO-based data and services into marine information provision in support of the security services, specifically to the Channel threat, and that is to the tasking partner. MISEC. Defence Systems. EO data are being provided by Satellite Observing Systems (wave and wind) and Plymouth Marine Laboratory (temperature and information obtained from ocean colour).

The main technical work was to develop the information system required to deliver the EO-based data into the existing Channel threat system. This included the development of the appropriate processing facilities to obtain the data from satellite, and integration and application of data to be made available to the user, which is provided in various forms, and visualised it in an appropriate manner.

The system developed during its deployment period is a vital component of the work supported by the UK MoD (Defence) and is now known as Marine extensible (planned for early 2004).

As an example of the benefits of the system, here we present screenshots taken from the modified Channel threat system. The left side, shows the ice height (top) and wind speed (bottom) from JASON. On the right the wind vectors from Quickbird.

**SEA STATE ALARM (1)**

Very high waves are responsible for the largest environmental forms on ships and other offshore structures. Once the significant wave height reaches the critical level, ships need to be immediately diverted to safer routes (e.g. heavy storms). A more thorough assessment of the wave conditions requires the examination of wave power, and wave directions. The latter can be accurately predicted by offshore operators, particularly those who are carrying out offshore operations to seaward (e.g. (p.4) lifting, heavy lift operations, transport of unusual loads). The cost of unproductive deployment of offshore operators and equipment is significant (up to 50% of costs can be allocated to bad weather conditions).

To address this issue, and investigate the potential value of delivering near-real-time data directed to offshore operators, Satellite Observing Systems (SOS) have developed a Marine State Alarm (MSA) concept. allwave height data are overlaid on the output of a wave model (in this example the CIPWS wave model) and colour coded (weather boundaries) identify where the model and alarm limits have been exceeded. The offshore operators can now take such actions as revising the time of their operations, or even making a decision to divert their vessel.

**SEA STATE ALARM (2)**

Cf. case study carried out as part of the ECO AMBUS (ECO) project.

Can satellite measurements of wave height improve the decision-making process on a ship carrying out a mission sensitive to sea conditions?

The case study involved using the CIPWS models (http://www.cipws.com) to predict the wave climate for the next 5 days for a ship sailing on a route in the North Sea. The ship is responsible for the transportation of a critical commodity that can only be transported under certain wave and wind conditions.

**COASTWATCH (An ESA GMES Service Element Project)**

The European GMES programme (Global Monitoring for Environment and Security) is a joint Marine and Land flagship project of both the European Commission and the European Commission to the future of Earth Observation (EO) technologies and its applications.

COASTWATCH is one of a number of projects funded under ESA’s GMES Service Element (GSE) programme that focuses upon the delivery of relevant services to end-users, primarily but not exclusively from ESA sources.

COASTWATCH aims to respond to the growing need for cost-effective, monitoring and data distribution to the oceanic and coastal Marine Environmental Policy community and other stakeholders such as the WaveWatch campaign, the British National Space Centre, and the Coordinated International Marine Environmental Policy (CIMAP). WaveWatch integrates a network of experienced service providers delivering EO-based information products on the coastal and marine environment.

**Case Study of 15 June 2003 Storm Railstorm off NW Scotland**

The storms on 15 June 2003 were severe off the coast of Scotland and involved strong southwest gales of up to 70 Beaufort (around 50 m/s). The event was also marked by very high wave heights. The waves at times were very high, with water surges up to 4 m.

**COASTWATCH - WaveWatch**

COASTWATCH - WaveWatch is a project supported by the UK Ministry of Defence and is currently under development by the University of Plymouth, Plymouth Marine Laboratory (PML), and Satellite Observing Systems (SOS).

**WindWave Forecasts for Sylt offshore Germany 15/03**

The platform operators had to decide whether to evacuate personnel from the platform, or not. They had no objective data at their disposal. The 25 m/s+ wave height and 80 m/s + wind speed predicted by CIPWS was close by in the hours preceding the highest wind. If real time satellite altimeter data had been available, it would have provided a robust basis for such a difficult decision. In the event, for lower forecast proved to be correct, and the evacuation sparked severe damages, nonetheless successfully (we have not heard about significant further damage at the moment).

The WindWave Forecast is a tool that is available to forecasters, but also to other users. The system is continually being updated with data from other sources, and provides real-time forecasts of wave and wind conditions, nowcast and forecast, at one hour resolution up to 24 hours.

**JASON and TOPEX SDR Significant Wave Height - 15/03**

- Approximate location of Schamolan

**Conclusions**

Satellite Observing Systems has been piloting a number of applications in which Near Real Time satellite wind and wave data are sent directly to the user. The guiding principle is that even though the sample is sparse, moderate, points to have been found areas, wave directions. At the very least these services help the user to assess the reliability of information from other sources (e.g. model forecasters) at least they make a significant contribution to reducing the uncertainty of the environment, next time, and operations.

Many segments of the marine industry could benefit from such services, including marine, oceanographic fleets, and.

The system is being rapidly improved to support the very same services and is being rapidly improved to be more widely available.

The systems forms band wave data and is itself a small part of the larger data set for each.