Using altimetry products for operational oceanography applied to tropical fisheries

M. Petit [1], P. Gaspar [2], M. Desruisseaux [1], F. Goujon [3], F. Poisson [4], D. Guyomard [1]
[1] (IRD, France)
[2] (CLS, France)
[3] (ORTHONGEL, France)
[4] (IFREMER, France)

The objective of the PELOPS project to develop satellite-based operational oceanography applied to fisheries (Projet d'ELaboration d'une Océanographie opérationnelle des Pêches Spatiale) is to try and answer this dual question: (1) What is the potential of near-real-time surface current products for describing the "oceanscape", and (2) how can such products be applied to operational tropical fisheries? This project will provide input altimetry data for the ocean information system (OIS), including sea surface temperature, vorticity, and ocean color, and will assess their relative potential for operational fisheries oceanography by merging these satellite/ environment data with catch data and biological data.

In pursuit of this objective, our work is focusing on matching sea level anomaly (SLA) data with other indicators describing the oceanscape of the western Indian Ocean, such as sea surface temperature (SST), vorticity and ocean color. The SEAS station (*Surveillance de l'Environnement* Assistée par Satellite) set up by the French IRD development research institute on Réunion Island receives daily AVHRR/ NOAA data and can access wind data measured by the scatterometers on the ERS and QUICKSCAT satellites. After pre-processing and processing of these multisatellite measurements, SST and vorticity fields related to surface winds are calculated and mapped over a zone covering 5°N to 41°S and from the East African coast to 80°E. We also have access through a pilot project to archive data from SeaWiFS/SEASTAR. The SEAS station was recently authorized to start acquiring data from this sensor (LAC) and to derive off-line chlorophyll concentrations (within two weeks).

Another key aspect of the project is the exchange of satellite-based products and in-situ data gathered continuously by selected fishing vessels (purse seiners and long-liners fishing for tuna and swordfish). These data acquired at sea include physical parameters (temperature, wind, cloud cover, etc.), catch reports, and measurements by special sensors mounted on fishing gear and on Argos transmitters. Catch data and biological data are formatted and validated by teams at IFREMER, the French institute of marine research and exploration (long-lining for swordfish), and IRD (purse seining for tuna).

The specific contribution of PELOPS to this program is to integrate altimetric SLA and current data derived from sensors onboard ERS and TOPEX/POSEIDON into the previously developed ocean information system (OIS), and to evaluate the relative potential of this new component within the system. To this end, CLS has adapted DUACS tools to calculate and map weekly SLA and surface currents in near-real time at a spatial resolution of one-quarter of a degree. These tools have been extended [Durand et Hernandez, 1999] to cover the equatorial zone (figure 1), based on the work of Picaut et al. [1989]. These products were included in exchanges between the SEAS station and fishing vessels for 18 months. However, budget restrictions

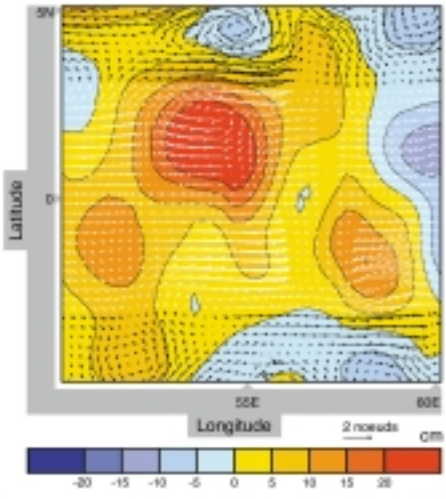

Figure 1: Example of currents computed in the equatorial zone.

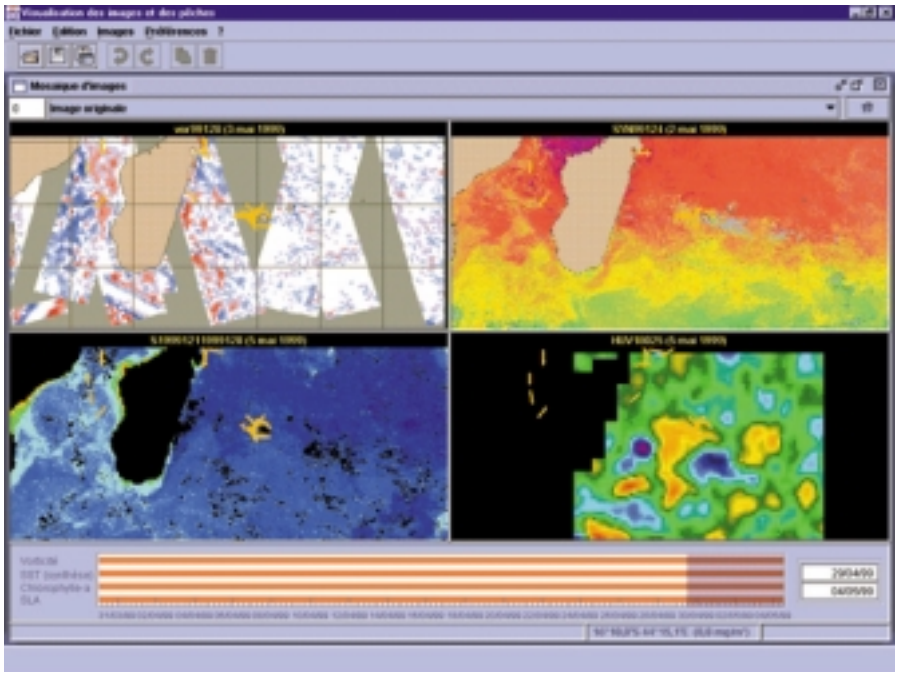

Figure 2: Example of spatial ocean situation based on different descriptors and the Ocean Information.

prevented the real-time part of the initial project from being totally completed.

Purse-seine trawlers have found the altimetry products defined by the PELOPS experiment to be an effective decision aid. Looking beyond this experiment, fishermen now want to continue receiving such data as part of a truly operational service. Generally speaking, vessels operating in pelagic fisheries have expressed a keen interest in satellite altimetry and derived products in recent years. As a corollary to this development, the product offering has been diversified and combined with an objective analysis of the real impact of such data on fishing methods and catches. Sometimes fishermen see unexpected benefits: for example, SLA and surface current data help them to predict how their buoys are likely to drift.

From a scientific viewpoint, we can use this data set, formatted to match spatial and temporal scales compatible with the OIS, to generate a classification of the oceanscape and process dynamics for this region of the Indian Ocean (figure 2).

The next step will be to apply this classification to fisheries so that we can derive stock and catch indexes. Such indexes are of great value to scientists tracking the evolution of stocks of species fished, as well as to regulatory authorities responsible for enforcing quotas and moratoria. Through ongoing efforts to combine these fishing data and environmental data alongside conventional statistics, we are now orienting our work towards multi-agent systems and neural networks. Our ultimate aim is to evaluate the impact of environmental data on optimizing the fishing system.

References

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Corresponding author:
Michel Petit
Pôle IRD, Maison de la Télédétection
500, rue J.F. Breton
34093 Montpellier Cedex 05 - France
E-mail: Michel.Petit@mpl.ird.fr