Driving mechanisms of Upwelling in the Sicily Channel

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We present the results of the analysis of a long time series of NOAA-AVHRR data taken over the Sicily Channel. Sea Surface Temperature values were derived from cloud-free AVHRR data over one year (1986) by means of a split-window algorithm (Dalu et al., 1985).

The dynamics of the studied area is very complex, since it is a crucial point for the water mass exchanges between the Eastern and the Western Mediterranean Sea.

In particular, satellite images indicate the presence of two different surface water masses, which are separated by the strong "Maltese front".

Our first effort was the investigation of the seasonal variability of the front, which greatly influences the hydrographic characteristics of the studied area.

After that, our attention was focussed on upwelling events occurring on the Southern coast of Sicily.

Cold water patches extending southward are very frequently seen offshore Mazara del Vallo. These patches mirror the bottom topography suggesting that the upwelling is stronger in the shallower areas such as the Adventure Bank.

The transient characteristics of the observed upwelling events suggest that the meteorological forcing plays an important role in generating the upwelling in that area. On the other hand, the influence of an amphidromic point for the semidiurnal tidal component, located near the island of Pantelleria, which may well affect the interfacial depth pattern (Artale et al., 1989), was also investigated.

The results of our study, carried out by means of a statistical analysis performed on several parameters extracted from the images (upwelling indices), show the different role played by the various factors.

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Satellite Oceanography in the 1990'S

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During the coming decade a number of space platforms capable of observing the oceans will be launched, beginning with ERS.1 and culminating with the advent of the operational systmes of the polar platforms. This paper reviews the achievements of oceanographic remote sensing by considering the parameters which can be obtained, their accuracy, and the ways in which such data have been used. The particular advantages of microwave sensors are highlighted. Some of the more important limitations of these techniques are also discussed.

Plans for statellite oceanography in the next few years are described in the light of past experience and emphasising the role which it will play in programmes of European interest. A trend towards combining data from different spaceborne sensors with sub-surface measurements and with models is foreseen. Such techniques are required not only for understanding and predicting large-scale climatic change, e.g. in the World Ocean Circulation Experiment, but for the more specific problems associated with regional oceanography, e.g. the Mediterranean.

An example of the latter is the Tyrrhenian Eddy Multi-Platform Observant (TEMPO) experiment of which an overview description is given. In autumn 1989 research groups from Italy, Germany and the UK participated in a two-week experiment to study an eddy/frontal system using a ship, aircraft and satellites. The satellite sensors were the AVHRR on NOAA satellites and the radar altimeter on GEOSAT. The ship was used to map the temperature and salinity structure of a 200 x 200 km area, making regular surface and upper air meteorological measurements. As it did so, it was used to deploy mooring and drifting floats for estimating currents. On board the aircraft was a microwave scatterometer and an infra-red radiometer which measured variations in surface roughness and sea surface temperature respectively. Near real-time satellite imagery was available for operational planning. Fortunately, the eddy became well-developed at the begining of the experiment and the observational programme was very successful. Objectives in the analysis phase include relating the IR and microwave remote sensing signatures to each other and to sub-surface structure, and obtaining a better understanding of the eddy and its role in affecting transports between the Tyrrhenian Sea and the rest of the western Mediterranean. Future observational phases are also planned during the lifetime of ERS-1.

Since the Mediterranean can be regarded as a natural laboratory for investigating oceanic processes the results of TEMPO are likely to be of general relevance to future synergistic studies of the global ocean.