SKIN AND BULK MEASUREMENTS OF SEA SURFACE TEMPERATURE IN THE SOUTH TYRRHENIAN SEA

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Measurements of skin and bulk sea temperature were made during several hydrographic cruises in the South Tyrrhenian Sea. Due to their small difference, both these temperatures are indifferently regarded as sea surface temperature. However, it was demonstrated that a vertical temperature gradient is needed to resist and regulate the fluxes of energy across the sea surface, and, therefore, its magnitude depends to the physical processes occurring at the ocean-atmosphere interface (SAUNDERS, 1967; KATSAROS, 1980)

In the Mediterranean Sea, where the air-sea interaction phenomena are very strong and the horizontal gradients of sea surface temperature are weak, it is important to analyse the differences between skin and bulk data.

The skin temperature was obtained using infrared radiometers mounted on the ship's bow at about 4 m above the sea level, while a towing thermometer was realized to measure the sea temperature in the first meter of the water column.

Together with the skin and bulk temperature data, are examined also atmospheric radiation measurements, contemporary recorded. The infrared radiation from the sky was chosen to represent the variations of the atmospheric conditions. Indeed, this parameter depends on the entire inhomogeneous atmospheric column. Its variability must be attribute to a change of cloud cover, humidity and air temperature profile. The heat fluxes from the atmosphere into the ocean strongly depend on all these terms. Thus, if the atmospheric radiation changes, there is a clear indication that must be changed the energy balance between air and sea. The interaction mechanisms between the two masses are not yet completely known, but evidently if one changes the other will try to adapt itself to the new conditions. For each mass the time required to do this and the intensity of the induced variation depend on the characteristics of the initial perturbation. On the contrary, the interface layer feels immediately any equilibrium change. Therefore light and short perturbations of one side don't disturb the other one, but influence the interface and the skin temperature will vary following all the modifications. Taking into account the sky radiation and the bulk sea temperature, the behaviour of the skin sea temperature was analysed in many different environmental conditions. The results show that in absence of significant variations of the air mass, the skin observations are in good agreement with the bulk samplings. The difference between the two temperatures remains nearly constant and horizontal gradients of sea surface temperature, even the smallest one, are detected in the same way by both the measurements. As soon as a change of the atmospheric conditions occurs, the skin data show oceanic features completely different from which inferable from the bulk observations and, in some cases, the data seem to be better correlated with the atmospheric radiation than with the temperature measurements of the water some centimetres below. This demonstrates that there is a temporal and spatial threshold beyond which the signature patterns obtained from radiometric measurements cannot be regarded as oceanic surface structures. Thus, satellite skin temperatures represent well the larger spatial scales of long-term and mesoscale ocean circulations, while small horizontal temperature gradients might be detected if only the horizontal distribution of heat and momentum through the surface is homogeneous .

It is also evident that the difference between bulk and skin temperatures must be taken into account to improve the calibration of infrared satellite measurements performing with *in situ* buoy data (ROBINSON *et al.*, 1984; SCHLUESSEL *et al.*, 1990). Moreover, the relation between the skin - bulk temperature difference and the heat flux were analysed.

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