



Near-surface thermal structure and surface diurnal warming in the Adriatic Sea using satellite and drifter data

Giulio Notarstefano, Elena Mauri and Pierre-Marie Poulain

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Trieste, Italy
(gnotarstefano@ogs.trieste.it / Tel: +390402140237)

An extensive set of in-situ temperature data collected by surface drifters is combined with satellite-derived sea surface temperature images to study the difference between the skin and bulk temperatures ($\Delta T_{skin-bulk}$) in the Adriatic Sea for the period September 2002 – December 2003. The variations of this temperature difference are described as a function of local wind speed and incoming solar radiation provided by a local area atmospheric model. The daily sea surface temperature variability is also assessed by computing the temperature difference between the daily maximal and minimal values ($\Delta T_{day-night}$) and monthly statistics of surface diurnal warming are computed.

The study reveals the existence of a strong diurnal warming of the skin layer (large $\Delta T_{day-night}$) and strong stratification (large $\Delta T_{skin-bulk}$) during the spring/summer season. The maximal value of the skin $\Delta T_{day-night}$ exceeds 4 °C in July 2003. $\Delta T_{skin-bulk}$ reaches the highest value (~ 5 °C) on a hot day (more than 600 W/m²) of May 2003 in weak wind condition (around 3 m/s). The diurnal warming and stratification persist from April to August, while during the winter months the $\Delta T_{skin-bulk}$ values are quite small (less than ± 1 °C) and the $\Delta T_{day-night}$ values are bounded by 2 °C. Our results also show that the smaller the wind speed and the higher the solar radiation, the larger $\Delta T_{skin-bulk}$. Above all it is the wind variability that affects the most the $\Delta T_{skin-bulk}$ variations. For strong winds (more than 6 m/s) they are almost constant around zero, independently of the solar radiation, because the near surface water becomes thermally homogeneous due to wind-induced vertical mixing. The data indicate that the monthly means of $\Delta T_{day-night}$ computed with the satellite

data can be as large as 2.5°C (May 2003) whereas those computed with the drifter data are smaller (less than 1.5°C). This difference is related to the overheating of the sea surface skin layer during the day. The monthly means of the times of the daily maximal and minimal temperatures are quite different for the drifter and satellite data. In average, the maximal satellite skin temperatures occur 1-2 hours prior to those inferred from the drifter, data due to the faster heating of the sea surface with respect to the water column below.