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Unusual thermohaline properties of the Gulf of Trieste (northern Adriatic) between October 2002 and September 2003

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The scope of this study is to present the spatial and temporal variability of temperature and salinity in the shallow (25 m depth) Gulf of Trieste (Gulf), the northernmost part of the Adriatic Sea. The cruise-data collected during the ADRICOSM project between October 2002 and September 2003 were analysed. Over this period, 37 cruises were performed to investigate thermohaline characteristics in the Gulf.

In October 2002 fresh water input was noted due to low salinity near the sea-surface in the northern part of the Gulf. This was mainly due to increased inflow from the Isonzo river which may significantly impact the temperature and salinity of the Gulf. Layers below the 5 m depth were thermally homogeneous during autumn and winter 2002-2003.
A relatively strong horizontal temperature gradient (4°C/1 km) and vertical stratification (3 °C/5 m) of the surface layer (0.5 m) in winter was measured in January in the northern part of the Gulf, which was mainly caused by river discharge, while the minimum temperature (7°C) was detected in the surface layer in February in the northern part of the Gulf, which was 4°C lower than that in the southern part of the Gulf, about 15 km southward from Grado.

In May 2003 thermal vertical stratification of up to 6°C/10 m developed in the upper part of the water column in the central part of the Gulf, while horizontally temperature and salinity fields in the Gulf were quite homogenous. During this period precipitation was below average and the influence of river inflow on the thermohaline properties of the Gulf was negligible. The vertical temperature gradient of the whole water column reached its maximum value (13.8°C/20 m) in early June 2003. During this period fresh water input was again low and salinity increased to values slightly higher than 38 PSU.

In July 2003: a water mass of high salinity (>38 PSU) characterized almost the whole water column with a strong vertical thermal gradient (maximum gradient: 8°C/10 m).
During the summer of 2003 the thermal stratification lasted until mid September with a vertical gradient of about 10°C in the central part of the Gulf. The maximum measured temperature in the Gulf was 29.1°C (11th August 2003) in the northern part of the Gulf, while the minimum temperature at that time was 13.3°C at a depth of 24 m near the sea-floor in the central part the Gulf. Some unusual distributions of surface salinity in the Gulf in July 2003 were observed, when the salinity field was characterized by a northward gradient unlike the south-eastward gradient of salinity observed in climatology data. The range of salinity in this period was between 37 and 38 PSU while in August salinity was rather homogeneous with its mean value around 37.9 PSU.

Another unusual distribution of salinity in the summer of 2003 was related to high salinities in the northern part of the Gulf where the Isonzo river discharges into the sea. This could be explained by the extremely dry and hot summer with very low river discharge below climatic seasonal values.

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