Geophysical Research Abstracts, Vol. 9, 01734, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01734

Exchange of water masses at the entrance to the Gulf of Trieste (northern Adriatic)

B. Bogunovic and V. Malacic

Marine Biology Station, National Institute of Biology, Piran, Slovenia (bogunovic@mbss.org / Fax: +386 5 671 2902 / Phone: +386 5 671 2923)

At the entrance to the Gulf of Trieste ADCP and CTD surveys were conducted to evaluate currents and water masses passing through the Gulf's entrance. The ADCP cruise campaign was performed at the entrance to the Gulf by crossing it along the idealized line that connects the southern part of the Gulf, the lighthouse at Piran in Slovenia, with the northern part, the lighthouse at Grado in Italy. CTD cruises were usually performed twice during each 25h ADCP cruise. Overall, four complete 25h surveys were made in the period between autumn 2004 and autumn 2005. The main purpose of the research was to see how much of the residual (25 h average) current at the entrance to the Gulf differs from the geostrophic currents and how strong the ageostrophic part of the flow is.

ADCP data were averaged over 10 min. intervals to remove high frequencies. The influence of tides was removed using the methodology of Simpson et al (1990). The harmonic fit was tested on the data from the nearby (10 km away) mareographic station at Koper. We obtained the best fit of 25h data ($r^2 > 0.9$) with three constituents (M_2, S_2 and K_1). Then we vertically integrated velocities for each cell and fit in a similar way for the transport at each location using the same three constituents to remove tides from the transports. From the CTD data we identified water masses and calculated the pressure gradient force in terms of geostrophic velocities with respect to different reference levels. However, in order to calculate properly the geostrophic currents, it was necessary to remove the tidal oscillation of the water column height since CTD casts were taken at different times. Correction of the sea-surface elevation was done in such a way that the sea-surface at each CTD cast during the cruise was 'levelled' to a neutral level. We calculated the geopotential heights from vertical density profiles, beginning the integration at the reference pressure (e.g. 10 dbar) then

integrating towards the surface in pressure steps equal to the pressure difference of the probe. In this way the integration ended at the surface with heights at zero pressure. From these geopotential heights tidal oscillations were removed, where the results from the 2D model of tides (Malačič and Viezzoli, 2000) were applied. Afterwards, correction of the pressure gradient force was calculated as was the inflow and outflow at the entrance to the Gulf with the assumption of the geostrophic balance.

Results from the survey of 7^{th} October 2004 showed that there was an inflow near the Slovenian coastline and an outflow in the central part of the transect at the entrance of the Gulf. However, at the Italian side of the transect there was a surface outflow of riverine freshwater. Similar results were obtained from calculation of the geostrophic velocities–an inflow at the Slovenian end and at the central part of the transect and a strong outflow at the Italian end of the transect.

References:

Malačič, V. and Viezzoli, D., 2000. Tides in the northern Adriatic Sea - the Gulf of Trieste. Nuovo cimento (C), 23, 365-382.

Simpson, J., Mitchelson-Jacob, E. and Hill, A.E., 1990. Flow structure in a channel from an ADCP, Continental Shelf Research, 10, 589-603.