Geophysical Research Abstracts, Vol. 7, 00536, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00536

Bulk parametrization and seasonal to interannual air-sea interaction over the region of eastern Adriatic Sea

F. Matić (1), B. Grbec (1), G. Beg Paklar (1)

(1) Institute of oceanography and fisheries, Split, Croatia (+385 21 358688)

Abstract

Although heat and water flux components are the key components of the coupled ocean-atmosphere system, direct surface flux measurement is available only for few locations at singular buoy or/and platforms on instrumented towers. In luck of such measurement for a particular location, surface fluxes can be calculated indirectly using measured quantities obtained either in situ or remotely. In the Adriatic Sea bulk parameterization was provided for particular location in the Northern and Middle part using climate data from various meteorological stations (Picco, 1991; Supic and Orlić, 1999; Grbec, 1997). Different parameterizations were used in analysis according to available data sets for various time scales. The main inconsistency was found for evaporation, as it is parameter, which strongly depends of chosen equation (Grbec, et al., 1997). Major limitation of many bulk parameterizations is that they are not well defined in light wind conditions (Large, 1996) for example, non zero latent heat flux at zero wind speed. As there is no ideal standard, or generally accepted method for the heat and freshwater flux estimation, net heat flux can be calculated in many different ways, which can produce for example forcing function acceptable in modeling. In order to provide enough good parameterization scheme applicable in Middle Adriatic for the purpose of the ADRICOSM experiment, surface heat flux components were calculated using mean hourly data from automatic mete-ocean station.

Using measured incoming short wave and backward long wave radiation from mete-ocean station set of bulk formulas was chosen and derived heat fluxes for period from 2000 - 2004. It is shown that short wave radiation calculated using Reed (1977) is overestimated for 20 W/m^2 and has unacceptable high error if it is used for calculation of solar radiation on hourly base. Using methods describe in Dobson and Smith (1988), new formula for calculation of hourly values of

solar radiation was found. Comparing measured data was found that long wave radiation is best described using May(1986).

The seasonal cycles of cloud cover, relative humidity, wind speed, air and sea surface temperature and surface heat fluxes were analyzed. Insolation was the dominant flux, followed by latent heat, long wave radiation and sensible heat. All of these fluxes have distinguished seasonal variation. Net heat flux for the ASHELF-2 area for analyzed period was in range between $Q = -8.7\ W/m^2$ and $Q = -22.8\ W/m^2$ and four years average was $Q = -15.9\ W/m^2$. Main cause of interannual variability of the fluxes is evaporation followed by long wave radiation. A widespread anomaly in meteorological condition occurred in 2003, resulted in anomalous heat and water transfer to and out of the sea.

Empirically obtained surface fluxes were also compared with the results obtained from the European Center for Medium-Range Weather forecast (ECMWF) atmospheric reanalysis at the corresponding points in the ASHELF-2 model domain.

References

[1] Dobson, F.W. and Smith, S.D.: 1998, Bulk models of solar radiation at sea, *Q. J. R. Meteorol. Soc.*, 144, 165-182.

[2] Grbec, B.: 1997, Influence of climatic changes on oceanographic properties of the Adriatic Sea, *Acta Adriat.*, 38(2), 3-29.

[3] Grbec, B., Beg Paklar, G., and Morović, M.: 1997, On evaporation problem over the Adriatic Sea, *Acta Adriat.*, 38(2), 69-77.

[4] Large, W.G.: 1996 An Observation and Numerical Investigation of the Climatological Heat and Salt Balances at OWS Papa, *J. Clim.*, 9, 1856-1876.

[5] May, P.W.: 1986, A Brief Explanation of Mediterranean Heat and Momentum Flux Calculations *NORDA Code 322, NSTL, MS 39529*.

[6] Picco, P.: 1991, Evaporation and heat exchanges between the sea and the atmosphere in the Gulf of Trieste during 1988. *Il Nuovo Cimento*, 14C, 335-345.

[7] Reed, R.K.: 1977, On Estimating Insolation over the Ocean, *J. Phys. Oceanogr.*, 7, 482-485.

[8] Supić, N. and Orlić, M.: 1999, Seasonal and Interannual Variability of the Norten Adriatic Surface Fluxes. *J. Mar. Syst.*, 20, 205-229.