EDDIES, MEANDERS AND MUSHROOM VORTICES IN THE COASTAL CURRENT SYSTEM OF THE BLACK SEA

Halil İ. Sur, Emin Özsoy and Ümit Ünlüata†

† *Institute of Marine Sciences,*
Middle East Technical University,
PK 28 Erdemli, Içel, 33731 Turkey

The Nimbus 7 CZCS visible images for June 1980 have been processed to display the variability of chlorophyll within the Black Sea Coastal Current. In addition to displaying the productivity variations along the coast, plankton related ocean colour in a time-series of high resolution images are used as a tracer identifying the unique dynamical features of the Coastal Current System. A meandering current system with an embedded train of mesoscale eddies is observed along the Turkish coast in the pattern of a wave motion progressing to the east between the Bosphorus region and İnceburun (Sinop). There is close correlation of the flow features with the continental slope topography. The abrupt termination of the wide western continental shelf at Sakarya Canyon appears to excite the oscillatory motion progressing rapidly to the east. In the east of the region of interest, the flow takes the form of a wide jet separating further from the coast, when, once again, the continental shelf becomes wider. The wide jet terminates with a dipole-like cap extending to the mid-basin region from the Arhangelsky Ridge east of Sinop. Ocean productivity that can be traced back to the low salinity waters of the Danube plume is transported along the western continental shelf and later becomes incorporated into the dynamically unstable current system in the southwestern Black Sea. In early summer, the continuous plume of chlorophyll observed during the spring appears to be rapidly depleted at the centers of eddies. The structure of the offshore filaments and dipole eddies associated with the Danube plume are also observed in the same series of images.

A unique visualisation of a mushroom eddy occurs offshore of the mouth of the Kızılırmak river in the October 1981 images. The mushroom is connected to the river mouth and the coastal maximum of pigment by a plume. The pigment distribution shows assymmetric spirals withint the dipole eddy. Momentum pulses acting across a coastal jet flow such as the Black Sea Coastal Current are suspected to create a vortex doublet confined in the surface layers with the observed deformation of the chlorophyll field. Such a pulse could be imparted by a local extremum of wind stress or the river plume itself. The filament connecting the dipole eddy to the coast follows the topographic contours of the local canyon topography adjacent to the Arhangelsky Ridge.

It is evident that the bio-optical features of coastal eddies is directly associated with the physical dynamics and the entrainment of surrounding water masses. It is of great utility to find that, unlike thermal images which yield data from a thin layer of surface

Rapp. Comm. int. Mer Médit, 33, 1992.

water influenced by short-term surface heat fluxes, and provided that the pigments are available, the CZCS data produce a depth integrated (to about 20m) signature of colour, faithfully reproducing features of the underlying flow dynamics.