CIESM Congress Session : Coastal / open-sea exchanges

Moderator : Mirko Orlic, Dpt of Geophysics, Univ. of Zagreb, Croatia

Moderator's Synthesis

The simplest model addressing dynamics in the shelf-break area is based on the assumption that the flow is steady, linear and inviscid and it results in currents paralleling the isobaths. The result, first obtained by G. I. Taylor and J. Proudman a century ago, implies that the exchange between the coastal area and the open sea is minimal. Therefore, the basic question is which processes break the Taylor-Proudman constraint and therefore enable the exchange to occur. A number of these processes have been detected over the years in various basins all around the world and have usually been found to belong to one of the three types: time-dependent, nonlinear or viscous.

This session showed that many of these processes are at work also in the Mediterranean Sea and that therefore the exchange between the coastal area and the open sea, often enhanced by topographic constraints, is of considerable importance there. The phenomena documented in the oral and poster presentations included barotropic tides (J. Sanchez-Garrido), barotropic-to-baroclinic tidal conversion (J. Abdennadher), dense-water formation and related buoyancy-driven flows (C. Eronat), current instability resulting in eddies (J. Isern-Fontanet) and wind-driven currents (J. Abdennadher, G. Mikolajczak). The resulting advection and turbulence support an exchange of momentum, energy, mass and various properties between the coastal area and the open sea, with the transport of organic matter receiving a particular attention during the session (A. Gogou).

The debate following the oral presentations revealed that the model improvements are rarely accompanied by the prompt use of state-of-the-art instruments in the Mediterranean area, which renders the verification of the modeling results difficult. As for the neglected processes, it turned out that the dependence of general circulation on turbulent exchange of heat and salt is seldom considered. Also rarely addressed is the origin of turbulence itself, with most attention being up to now paid to the instability of internal waves – particularly those of tidal origin. It may therefore be expected that in the future the generation of turbulence in the Mediterranean Sea will be explored in more detail, by allowing not only for the breaking internal waves but also for the buoyancy and wind forcing, and that the control the turbulence exerts on the residual flow will receive the attention it deserves.

★ ★
★