SOME LABORATORY RESULTS ABOUT FLOWS BETWEEN GIBRALTAR AND SICILY STRAITS

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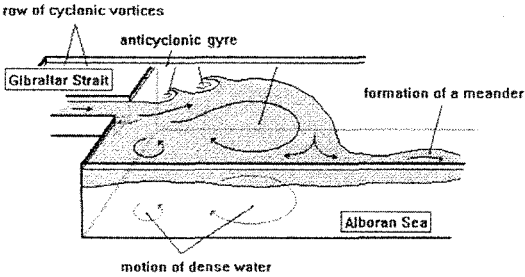
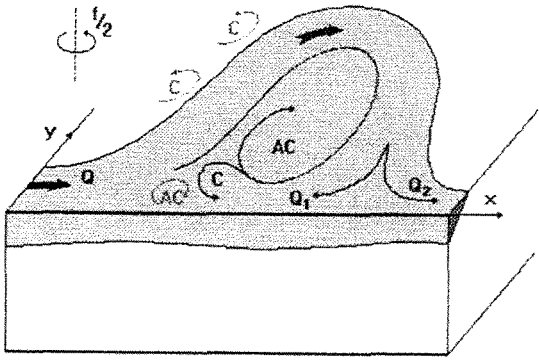
In order to describe, understand and simulate the circulation in the Mediterranean Sea, the Coriolis Laboratory conducted, for several years, some experiments in complement with the observation and numerical models. It is important to take into account the earth rotation in order to integrate, in a general circulation model, some mesoscale process for example : shear flow, currents, stratifications, instabilities... Using the large rotating platform of Grenoble gives us the possibility to approach the similitude according to the Burger and Ekman numbers. The most important results are developed within three items : Strait of Gibraltar, Alboran Sea and Algerian Current

Strait of Gibraltar and Alboran sea. The circulation of the water masses in the most western part of the Mediterranean Sea is characterized by some well-known features as the presence of one or two non-persistent gyres in the surface water (MAW). The flow is modelized in a rotating rectangular tank of 9 x 2 x 0.6 m, separated in two basins connected to each other by a strait. The currents are generated and maintained with the help of a hydraulic system using pumps. Owing to visualisation methods, the flow pattern is clearly put into evidence and data are gathered at the same time. The experiments reveal many important features of the currents in the strait. The most important of these are the presence of anticyclonic relative vorticity in each current and the capability of the strait to limit the exchange. The data show that there is a good correlation between the maximal exchange and the hydraulic control. This study needs further investigation, especially to evaluate the importance of geostrophic control on this process.



In the basin related to the Alboran Sea, the formation and the growth of an anticyclonic gyre has been observed. Its structure and "stability" appear to be dependant on the regime of the strait flow in a deterministic sense. In particular, they are widely dependant on the ratio of the internal radius of deformation to the width of the strait. The magnitude of the flow rate of the "atlantic" current does not change the structure of the flow, but modifies the growth time of the gyre. The flow can be considered as a superposition of many phenomena which can be study individually.

Algerian Current. The stability of a surface boundary current which flows over stationary denser water in a rotating system is studied in the laboratory. The current has constant flow rate and uniform velocity at its source. The gravity current can either be stable or unstable depending on the value of some of the non-dimensional numbers governing the flow. It has been seen that whatever the value of the Burger number is ($0.15 \leq Bu \leq 0.82$), the flow is unstable when the vertical Ekman number is smaller than $3\ 10^{-3}$ and stable above. The value of the ratio of the current thickness to the total depth can also be important. However, the effects of changing this parameter and the Ekman number has not been studied yet.



The instability degenerates into one or several meanders composed essentially of an anticyclonic eddy within the current and a cyclonic eddy at the front. Smaller the Ekman number is, more numerous the meanders are. They grow within the current being fed downstream by the current itself. At the same time, they move within the flow in the same direction. As their size increase, the interface moves downward below them. This result is in very good agreement with *in situ* measurements of the Algerian Current. Finally, although modeling is schematic, we obtain some goods results according with the observations and numerical model.

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