SOME LABORATORY RESULTS ABOUT FLOWS BETWEEN GIBRALTAR AND SICILY STRAITS

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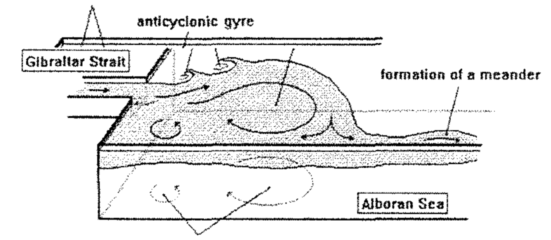
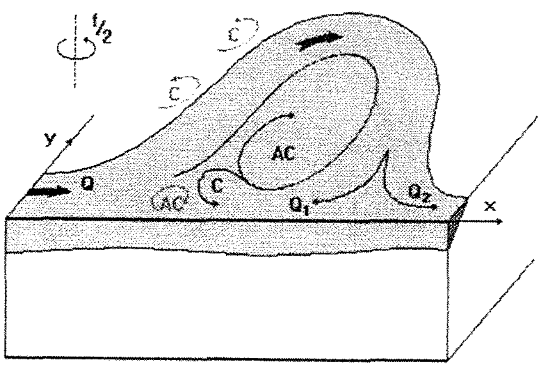
In order to describe, understand and simulate the circulation in the Mediterranean Sea, the Coriolis Laboratory conducted, for several years, some experiments in complement with the observation and numerical models. It is important to take into account the earth rotation in order to integrate, in a general 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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SEA SURFACE TEMPERATURES AND CIRCULATION PATTERNS AT THE AEGEAN SEA USING AVHRR DATA

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This paper presents results from a joint project between the University of Dundee and the University of the Aegean. The project deals with the monitoring of the quality of the sea water environment using *in situ* measurements and satellite image data (CRACKNELL *et al.*, 1994). Part of the project was to analyse AVHRR images of the Aegean Sea because of their capacity for providing large area coverage of regional information regarding sea surface temperatures (SST) and circulation patterns. This information will provide more understanding of local marine process.

AVHRR scenes captured on 4 March 1992 and 5 June 1992 were acquired from the Dundee Satellite Station. Two AVHRR scenes captured on 11 July 1992 and 28 August 1992 were purchased from the National Remote Sensing Center Limited, United Kingdom.

Each sub-scene measuring an area of 512 by 512 pixels was extracted from each AVHRR scene which covered the sea water region of approximately between latitudes 27°N to 41°N and longitudes 23°E to 27°E including the Aegean Sea, Mytilene Sea and Saronikos Bay. The NOAA-11 Multi-Channel Sea Surface temperature (MCSST) algorithm was used for computing the SST value at each AVHRR pixel location. The land and cloud areas were masked out. The generated SST images for all the sub-scenes are shown in Figures 1 to 4 and were colour coded for displaying temperature values.

On all image dates the sea water south of Lesvos was relatively warmer than in the north. In the central area of the Aegean Sea the surface temperatures were relatively cooler than the surrounding areas on all scenes. This might be due to a cold current coming through the Dardanelia Strait towards the Aegean Sea. This cold pattern extending southward became progressively warmer with the distance southward.

The effect of land masses (islands) was observed in the SST images.Observation of the temperature images reveals that the temperatures south of these land masses were generally higher than the SSTs of the northern part of these land masses. This could be due to the north facing coastal waters being more exposed to the southerly flowing cool current whereas the south facing coastal waters were protected from this current. During the summer months the July and August scenes show higher SSTs as compared to the June surface temperature.

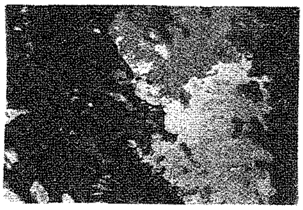

Figure 1. Temperature Distribution (°C) on 4 March 1992. Colour code: Dark blue<10; light blue 10-11, dark green 11-12; light green 12-13, yellow 13-14; orange 14-15; red>15.

Figure 2. Temperature Distribution (°C) on 5 June 1992. Colour code: Dark blue<18; light blue 18-19, dark green 19-20; light green 20-21, yellow 21-22; orange 22-23; pink>24.

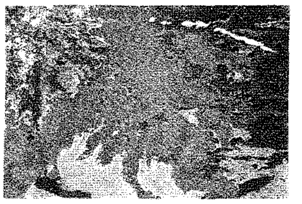

Figure 3. Temperature Distribution (°C) on 11 July 1992. Colour code: Dark blue<21; light blue 21-22, dark green 22-23; light green 23-24, yellow 24-25; orange 25-26; pink>27.

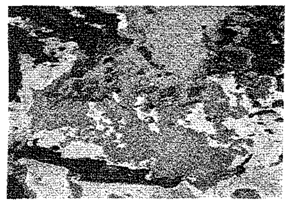

Figure 4. Temperature Distribution (°C) on 28 Aug. 1992. Colour code: Dark blue<22; light blue 22-23, dark green 23-24; light green 24-25, yellow 25-26; orange 26-27; red>27.

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