RECENT FLOW OBSERVATIONS IN THE STRAIT OF GIBRALTAR

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A new two-year (April '94 - May '96) field program has been started to measure the exchange through the Straits of Gibraltar and Sicily in coordination with efforts from the European Community in the PRIMO-1 Program. This new effort concentrates on measuring the exchange through the Strait of Gibraltar, where current, conductivity, temperature, and pressure measurements are being made at two sites along the Strait axis, one at the sill (Camarinal) and the other at a section between Gibraltar and Ceuta at the eastern end of the Strait. These measurements are complemented by an array of four pressure sensors, also measuring conductivity and temperature, at Punta Camarinal and Tangiers across the sill section and at Ceuta and Algeciras. Two other pressure, conductivity and temperature sensors are deployed across the Strait of Sicily in Mazara del Vallo (Sicily) and Cape Bon (Tunisia) to complement PRIMO-1 current meter moorings deployed across the Strait of Sicily.

It has been more than eight years since the Gibraltar Experiment (Oct '85—Oct '86) ended, and still some of the important questions that it posed have not been properly answered. Most importantly :

(a) Is the hydraulically controlled exchange always maximal, or does it switch at times to a submaximal exchange state and if so, is this switching seasonal?

(b) What is the best observational method to efficiently and continuously monitor this exchange state?

and (c) How is this alternating state affecting the magnitude of the exchange between the Mediterranean Sea and the Atlantic Ocean?

This new field program is designed to address these questions, and also, by complementing the intense PRIMO-1 effort that is simultaneously focusing on the interior of the Mediterranean Sea, to appropriately address more global questions about the straits role in the Sea's circulation. Another important objective of the new measurements is to obtain accurate estimates of salt and heat fluxes occurring through the Strait of Gibraltar. These fluxes relate to integral climatic processes affecting the whole Mediterranean basin. For example, the salt flux at Gibraltar is a direct measure of net evaporation over the Sea, a measurement difficult to obtain from observations over the whole basin.

During this communication, we will present the preliminary results obtained from the first six months of deployment (April '94 - October '94) in relation to the overall objectives of this new field effort.

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ADRIATIC SEICHE DECAY AND ENERGY LOSS THROUGH OTRANTO STRAIT

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A salient feature of sealevel records from the Adriatic Sea is the frequent occurrence of energetic seiches with a period of about 21 hours. Once excited by a sudden wind event, such seiches may persist for days. They may lose energy either to friction within the Adriatic, or by radiation through the Straits of Otranto into the Mediterranean. The decay caused by both mechanisms has been included in a one dimensional variable cross section shallow water model of the Adriatic. Friction is parameterized by the coefficient k appearing in the linearized frictional acceleration term - ku/h (where h is the depth and u is the shallow water along-basin velocity), and radiation through Otranto is described by the coefficient a appearing in the strait boundary condition z = auh/ (sqrt) gh in which additionally z is sealevel and g the acceleration of gravity. Repeated runs of the model delineate the dependence of model seiche decay time on k and a shown in the accompanying figure.

Actual decay times of the fundamental longitudinal mode seiche have been determined by constructing the decay envelopes of sealevel (detided and subjected to a narrow band filter of width .0375 oph centered around the seiche frequency) from three locations (Bakar, Split and Dubrovnik) along the Croatian coast during twelve seiche episodes between 1963 and 1986, and taking into account only those portions of the envelopes which decrease exponentially in time and for which the modeled effects of along-basin winds were smaller than the error of estimation of decay time from the envelopes and the effects of across-basin winds were small. The average decay time thus obtained was 3.2 +/- 0.5 days.

For the model to reproduce this observed decay time with no energy loss through Otranto, a friction coefficient of k = .00067 m/s was needed; to reproduce the observed decay time with no friction, a coefficient of energy transmission of a = .064 was required. To proceed further, an estimate of k that is independent of observations of seiche decay time is required. ORLIC *et al.* (1986) estimate k = .00113 - .00124 m/s by balancing surface and bottom stresses in wind driven currents in the Northern Adriatic; ORLIC (1987) estimates k = .0006 - .00153 m/s from the observed decay time of near-inertial oscillations in the Northern Adriatic. The corresponding values of a needed for the model to reproduce the observed seiche decay time are zero to 0.0085; these imply the loss of zero to 3.3% of the seiche energy to the Mediterranean every seiche period. Since the decay time might be as short as 2.7 days, a could be as great as .02; in this case 7.8 % of the seiche energy would be lost to the Mediterranean every seiche period.

REFERENCES

ORLIC M., 1987. Oscillations of the inertial period on the Adriatic Sea Shelf. *Cont. Shelf. Res.*, 7: 577-598.

ORLIC M., Kuzmic M., and Vucak Z., 1986. Wind-curl currents in the Northern Adriatic and formulation of bottom friction. *Oceanol. Acta*, 9 : 425-431.