**Modelling the general circulation of the Aegean Sea**
**Part I: Wind Forcing Experiments**

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The Princeton Ocean Model (POM) is used to study the wind induced general circulation of the Aegean Sea. POM is a free-surface sigma-coordinates 3-D primitive equation model (BLUMBERG & MELLOR, 1987) designed to simulate both coastal and open sea dynamics. Depth integrated and 3-D equations are solved with different time step using a time splitting technique. The model includes the MELLOR-YAMADA 2.5 turbulence closure scheme (MELLOR & YAMADA, 1982) to calculated vertical heat and momentum diffusivities while the Smagorinsky formula is used for horizontal diffusivities. The model grid covers the area 21°-30° E and 33°-41°10' N with a spacing of 1/6th of a degree in cartesian coordinates and the topography used has been smoothed by an 8th order Shapiro filter. The vertical resolution is 16 levels with logarithmic distribution near the surface. The Levitus hydrological data interpolated in the model grid and mapped into sigma coordinates have been used as initial conditions. The model is forced by monthly climatological wind stress data (HELLERMAN & ROSENSTEIN, 1983). On the open boundary points an upstream advection equation is used for temperature and salinity with boundary values of T and S held fixed to the climatological profiles. At the surface, temperature and salinity are also held fixed to climatology.

In figure 1 the annual mean barotropic transport streamfunction after 5 years of integration is presented. Although a perfectly repeated seasonal cycle is observed in the kinetic energy of the model, almost all the general circulation features maintain their structure throughout the year with seasonal variations only in velocity magnitudes. This absence of strong seasonal variability is concurrent with the almost steady wind field pattern provided by the climatological data. Barotropic and baroclinic velocities are of the same order with typical values 5-10 cm/sec. A number of well known circulation features can be recognized in figure 1. In the SE part (Rhodes area) a cyclonic circulation with flow parallel to the eastern straits is established. This flow enters the Aegean mainly through the central of the eastern straits and bifurcates towards the central Aegean and the Cretan sea, being similar to the typical winter circulation pattern in the area. South-east of Crete a well formed anticyclone can be observed similar to the so called "Ierapetra Gyre" observed from both hydrological data (ROBINSON *et al.*, 1991) and infrared satellite images. This gyre seems the most energetic feature of the area with maximum velocities of -30 cm/sec. South-west of Crete a large cyclonic feature also known from the POEM data as Cretan Cyclone is observed. Another strong mesoscale feature is the double anticyclonic gyre SW of the Peloponnesian peninsula. This gyre has been found to be the most intense feature of the summer 1986 general circulation of the Ionian sea (NITTIS *et al.*, 1992) and is known to be a permanent feature of the area. In the Cretan sea, two anticyclonic and two cyclonic gyres are present. In the central Aegean, the flow is northward in the centre and southward along both eastern and western coasts forming a complex system of one cyclone and one anticyclone. In the northern Aegean sea, the prevailing feature is the anticyclonic gyre south of the Athos peninsula.

Wind Forcing Experiment (Year 5)

Barotropic Transport (in Sv)

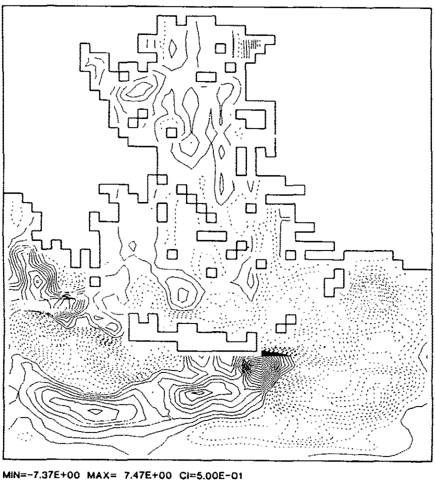


Figure 1

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