Seiche of eight and six hour periods in the Adriatic Sea

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In order to reproduce bora induced motions on the Adriatic shelf going from the hydrostatic state marked seiche and inertial oscillations are present in modelling results which will be discussed here. Here used model is a levels non-linear model written in semi-staggered grid with forward-backward time scheme.

Considering area of the longitudinal cross-section of the Adriatic basin one can see that "G" point in the Figure 1. to which the area of integration extends, can be identified as the opening of the semi-closed basin surrounded by infinite sea. This semi-enclosed basin is the main part of the the Adriatic shelf. For the Jabuka Pit the results of spectral analysis of the sea level (using Daniell's filter) are given in Figure 2. It is well known that the main periods of Adriatic seiche are 21, 11, 8, 6,... hours (MANCA *et al.*, 1974). In Figure 2 the seiche of 8 and 6 hour periods are pronounced while these of periods of 21 and 11 hour are not. VERCELLI (1941) identified seiche of the period of 21 hours as fundamental of the whole Adriatic, that of the period of 11 hour as binodal seiche of the whole Adriatic and the seiche of of 8 and 6 hour periods in the modelling results as free oscillations of the Adriatic considering it as closed basin. Used boundary conditions and obtained model results confirm that these oscillations are free oscillations of the sea over the Adriatic shelf. Results of spectral analysis of sea-level obtained by the numerical model were tested by spectral analysis of residues (difference between observed and predicted sea-level) at Koper (North Adriatic), Split (Middle Adriatic) and Dubrovnik (South Adriatic). Monthly time-series of residues were analyzed in January 1982 where free oscillations of the whole Adriatic Sea were observed. Seiche of 8 and 6 hour periods were observed at Koper and Split but not at Dubrovnik. This is shown in Figure 3. These experimental results confirmed theoretical results obtained by the model stated that 8 and 6 hour seiches are free oscillations of sea over the Adriatic shelf.

Figure 1 - Cross-section area in function of distance from Otranto to Venezia in 10^6 m^2

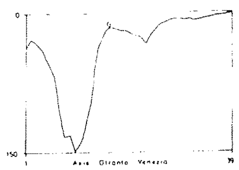


Figure 2 - Spectral density predicted by the model in the Jabuka Pit

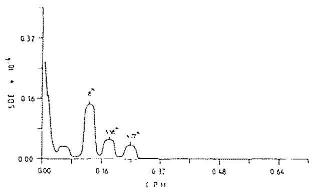
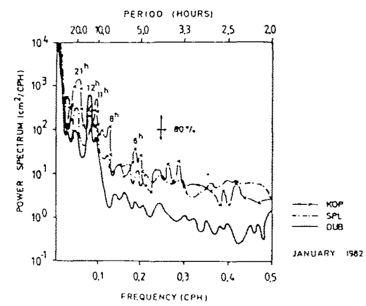


Figure 3 - Observed spectral densities



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Residual Currents in the Northern Adriatic over the Year-long Season

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Sea currents in the northern Adriatic (particularly along the west Istrian coast, Croatia) were frequently measured, at different positions, and in different seasons (KONRAD, PRECALI ed., 1985-1991). Because of specific purposes (ORLIC, 1988; CEROVECKI, 1991) these measurements were usually carried out for one to two months continuously. We were interested in the residual currents variability over the year-long season. Therefore, in May 1989 we started to measure continuously sea currents at one position of the northern Adriatic.

The position of the fixed station (A) was φ=44° 47.27' N, λ=13° 30.00' E (15 NM west of Pula in Istria, 43 m depth).

Measurements were made in the surface (6 m) and bottom layer (37 m) by AANDERAA RCM-4 current meters. The sampling interval was ten minutes.

After decoding of data, twelve hours average values of u and v (i.e. E, N) components were found, and then the five day-moving average was made. In effect this was an equivalent to apply one low-pass filter on the time series data. To express the results of these procedures it is very suitable to plot a progressive vector diagram - hodograph of the residual currents during an one year period. We chose the year 1990, of the surface layer of a considerable station, and the progressive vector diagram hodograph is given in Fig. 1.

We must notice that the thin dot line in Fig. 1. corresponds to the intervals with no measurement data. Because of some technical disturbances during the measurement period (damages of rotor, loosing instruments, etc.) some gaps in the time series exist. We fulfilled the missing data with the curve got by the following method: In every missing data period we interpolated the velocity vectors with the average value of the velocity in the periods of the same duration before and after of the missing data period. (The reason for the use of this method of interpolation was the analysis of intensity of the current vectors during the whole period).

An analysis of the global flow i.e. long-term current variabilities (in the northern Adriatic) could be very important for the analysis and explanation of many annual and long-term processes, for example: for bio- and eutrophication cycles as well as for transport and long-term sedimentation processes.

The long-term variation of the residual currents of the bottom layer and for other periods when the currents were also measured will be presented at the October's ICSEM session.

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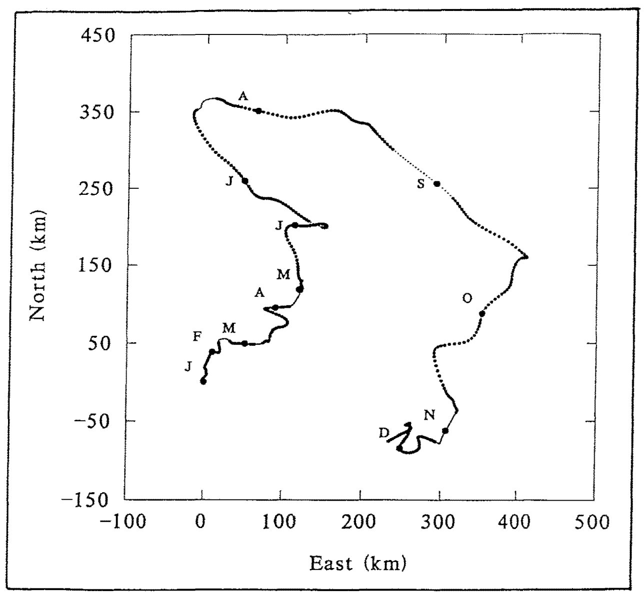

Figure 1. Progressive vector diagram - hodograph of the residual currents in the surface layer at station A.

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