Transmission of the seiche energy through the Otranto Strait

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Thirteen episodes of seiches, recorded at three locations along the east Adriatic coast between 1963 and 1986, were analysed. Energy spectra of residual sea levels showed that the first Adriatic mode, whose period is 21.6 hours, dominated over the others. Therefore, a band-pass filter was applied to isolate this oscillation. Intervals with free oscillations only were determined by analysing envelopes of filtered residuals. Envelopes covering the separated intervals were represented by exponential curves wherefrom decay times were estimated. The average decay time obtained in that way for three analysed stations (Bakar, Split and Dubrovnik) equalled 3.3 ± 1.2 days. This compared favourably well with results published by GODIN and TROTTI (1975) for the Trieste station.

Two flat-bottom models were used to interpret the empirical results. The first model, incorporating linear bottom friction (DEFANT, 1961), reproduced the average decay time with the bottom-friction coefficient $k = 1.74 \times 10^{-3}$ m s^{-1}. The second model, reproducing energy transmission through the open boundary, required a coefficient of energy transmission b = 0.063 (implying that 22% of the seiche energy is transmitted through the Otranto Strait). In such a manner maximal values for the two coefficients were determined.

Finally, a numerical model was developed in order to describe damping caused by both mechanisms. The real topography of the Adriatic Sea was taken into account. A series of computations for different possible values of coefficients k and b were carried out. An example of elevations obtained is given in Fig. 1. Using the empirically obtained decay time and values of k which had previously been determined for the Adriatic (ORLIC, 1987) it was possible to estimate values of b. It was found that for k reaching the minimal value detected in the Adriatic (0.5×10^{-3} m s^{-1}) b equals 0.018. In that case 7% of the seiche energy passes through the Otranto Strait. The model allowed the maximal value of $k = 0.74 \times 10^{-3}$ m s^{-1} when, of course, b equals zero and the seiche energy is perfectly reflected back into the Adriatic. It might be concluded that only a small percent of the seiche energy incoming to the Otranto Strait is transmitted to the Ionian Sea. Both the shape and closeness of the Adriatic Sea make the seiches persistent.

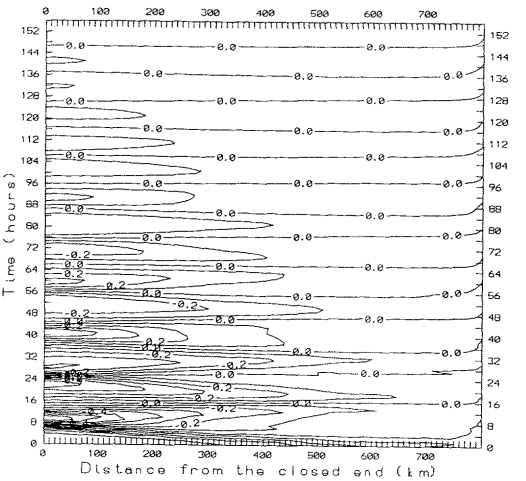

Figure 1. Space-time plot of elevations computed by the numerical model, when the coefficient of bottom friction equals 0.5×10^{-3} m s^{-1} and the coefficient of energy transmission is 0.015. Contouring interval is 0.1 m.

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