



## Abstract View

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# Two-layer Exchange in an Estuary Basin, with Special Reference to the Baltic Sea

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### ABSTRACT

Stationary and transient states of a two-layer fjord-type estuary are discussed analytically. The forcing functions are the outer salinity  $S_0$ , the fresh-water supply  $q_f$  and a meteorologically forced barotropic transport  $q_m$ . Forced nonlinear, time-dependent cases have been studied numerically. Some associated laboratory experiments are described.

The main results obtained are as follows: (i) A single steady state exists; this is approached in an exponential-like way. (ii) The total mixing through the interface must vary with depth (decrease for increasing interface depth) to allow a stable steady state. (iii) The static stability increases with increasing fresh-water supply, up to a critical value where the two-layer model breaks down. (iv) An added oscillatory component in  $S_0$  increases and in  $q_f$  decreases the estuary salinity and the static stability. The effect of an oscillatory  $q_m$  may go in either direction. (v) The statistical steady state is sensitive to certain high-order statistical features of the forcing functions. It is suggested that changes in such statistical features, rather than changes in mean forcing conditions, may explain observed physical-chemical secular variations in the Baltic, in particular the drop of oxygen concentrations of the deep water.

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