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Energetics of semi-enclosed basins with two-layer flows at the strait

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The circulation of semi-enclosed seas with two layer flows at the Strait is studied on the basis of new volume integrated mechanical energy equations. The new equations show that the energy flux at the open portion of the boundary (the strait) is proportional to the surface buoyancy flux
integrated over the basin area, with the constant of proportionality
given by the interface depth. Thus the circulation in these marginal seas is generally powered by wind stress but only in the anti-estaurine case also by buoyancy fluxes. In the Baltic and Black Sea cases, energy is actually subtracted by the buoyancy forcing to the wind induced circulation and the basin normally will not have a vigorous circulation. For the Mediterranean, both buoyancy fluxes and wind stress work contribute equally to power the circulation while the Red Sea is noticeably powered mainly by buoyancy fluxes. This new energy framework extends Knudsen salt and mass balance characterization of the basin circulation structure, connecting in energy terms the basin circulation to the buoyancy and wind stress work forcings.