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The energy conservation in the ocean linked with the generation and propagation of the fast barotropic Rossby waves

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In a recent study (Ivchenko et al., GRL, 2004) it was shown, that a sea ice/salinity anomaly near Antarctic generates a Rossby wave that propagates across the Pacific in only a few days. This signal is reflected at the western boundary of the Pacific and generates an equatorwards propagating Kelvin wave. A buoyancy term is responsible for the exchange between the internal (baroclinic) mode of kinetic energy and potential energy. Energy exchange between internal and external (barotropic) modes involve another mechanism, relating to the JEBAR effect (Joint Effect of Baroclinicity and Relief) and is viable only in the presence of variable topography and a variable density field. Numerical simulations using the INM model (Institute of Numerical Mathematics, Moscow) show that Available Potential Energy (APE) in the western Pacific sub domain increases in time and reaches a maximum value between 500 days and 1200 days depending on the amplitude of initial salinity anomaly. The JEBAR and buoyancy terms are almost mirror-symmetrical.In the eastern Pacific sub domain the JEBAR term is nearly zero all the time, whilst the buoyancy term shows a persistent oscillation, starting from about 3 months, after the arrival of the equatorial Kelvin wave. The period of oscillation is between 200 and 400 days.