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River inflows in ocean general circulation models: a closure through energy conservation

R. Hordoir (1), J. Polcher (2), J-C Brun-Cottan (1) and G. Madec (3)

(1) M2C, UMR 6143, Université de Caen, France (2) LMD - IPSL, Paris, (3) Locean - IPSL, Paris (hordoir@meca.unicaen.fr)

A method is suggested to reject properly river inflows in ocean general circulation models. As the coarse grid of these models can not represent the baroclinic dynamics of river plumes, a closure has to be made using another conservation than momentum. Methods used for simulation of meso-scale processes such as turbulence suggest to introduce energy conservation in order to estimate the additional flow that has to be added to ocean general circulation models in order to represent the input of potential vorticity created by continental runoff. Once defined the flux of energy brought by freshwater inflows from a general point of view, we suggest methods to take into account all the other energy sources or sinks that will affect the total conservation of energy within the grid cell of an ocean general circulation model. These sources and sinks are for instance wind, gravity wave generation through geostrophic adjustement, power lost by friction. Each of them has a different interaction with a river plume that has to be estimated from the point of view of the power provided to the system or taken away from it. Based on diagnostics made on a high resolution simulation, we apply our method and check that is is possible to link the flux of energy exiting a coarse resolution grid cell to the one brought within the grid cell by river inflows.