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Spotting what lacks to resolve properly river inflows in ocean general circulation models

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Continents provide about 1,2 Sv of freshwater runoff to the global ocean. Although this amount is small compared with any deep ocean current, recent works show that the influence of river inflows can not be neglected in global ocean models used for climate forecasting. In most ocean general circulations models, river inflows are rejected as rain at the surface of the coarse resolution grid cells of the model. In order to spot how satisfactory this representation can be, we propose inter-comparison tools based on two numerical configurations. The first one is used as a reference and is a high resolution based on POM that represents the river plume created by the Mekong river delta. The second one covers the same area but is based on a zoom of the half-a-degree configuration of the NEMO ocean general circulation model in which water is rejected as rain on two grid cells. Both configurations have the same wind and freshwater forcing. Comparisons between the two configurations show that the dynamics of river plumes are represented in the ocean general circulation model when wind blows in the upwelling direction, although a lack of precision in the amplitude of flows may be observed. When wind blows in the downwelling direction or when its influence is weak, the grid of the ocean general circulation model can not represent the baroclinic dynamics from the amplitude or variability point of view. The physics of river plumes suggest that the resolution of the ocean general circulation model's grid is responsible for this mistreatment. The grid resolution is too coarse compared with the baroclinic Rossby radius of the dynamics created by the freshwater inflow. A parametrization has to be added to ocean general circulation models in order to take into account the input of potential vorticity created by freshwater inflows. We suggest to base this parametrization on energy conservation.