River plume dynamics : sensitivity to the river numerical implementation and model grid resolution

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In numerical models, rivers can be represented as a true mass flux (true open boundary conditions) or as a precipitation (salinity relaxation). These approaches are different since the true mass flux is considered barotropic and adds momentum to the system while the salinity relaxation method is only considered at the surface and does not add any momentum to the system. In the modeling community both approaches are widely used. This study investigates the impact of the choice of the river numerical implementation on the river plume dynamics. Results show that the estuary and river plume dynamics are very sensitive to the choice of the river numerical implementation. For our model configuration it is shown that the different buoyancy fluxes are the main factor that impact the solution while the river momentum impact on the solution is weak. Original potential vorticity anomaly diagnostics are employed to show how the river-estuary system dynamics are changed through the different mixing rates. Sensitivity tests on the model grid resolution and vertical mixing scheme are also done.