

High flow, low flow?: atmosphere and ocean in a tank **Hot, cold and particle-filled density currents as they flow in the atmosphere and ocean**

From a Subscriber, British Columbia, Canada

This is potentially a great activity, but we had real trouble on two fronts; Keeping the liquids inside the pipe (both the hot and cold leaked and flowed out of the bottom), and there was also a great deal of turbulence as we lifted out the pipe each time to let the fluids mix. I'm not sure whether it was our specific setup.

The activity was however great fun and provided a lot of meat for discussion and anticipation/prediction of what might occur. I have tried something similar before with a water tank and adding some ice cubes and a few drops of blue dye at one end and attaching a heat lamp over the water at the other end (into which you add a few drops of red dye). This works really well and you don't have the problem of turbulence from taking out the pipe. Worth a try either way.

My daughter had a great suggestion - she wondered about how you could use this experiment to model river water entering a marine basin, as in the Fraser River Delta here in BC. Perhaps the experiment could be done with a basin of sea water and fresh water (coloured slightly brown from silt and clay) added through a pipe at the side?

Anyway a good thought provoking activity with a lot of different applications - atmosphere, oceans, deltas, turbidity currents, and fun as well.

From the Earth Learning Idea team, UK

We're really glad you liked the activity and found it such fun.

Don't worry too much about the leakage - a little leakage usually happens and doesn't make very much difference. It is important to reduce the turbulence though. To do this, just lift the pipe out very, very slowly, taking at least 20 seconds to do so.

We have tried the ice/heat lamp and dye activity. This does show how cold water sinks and warm water rises nicely - but is usually equated to convection currents. The important thing about the activity as written in the Earthlearningidea sheet is that convection doesn't happen, but rather the currents stay separate and discrete - the way that the warm Gulf Stream stays separate from the water beneath and cold bottom currents stay separate from the water above.

Your daughter's idea is great and works really well (although it is better to colour the fresh water with

food dye, as the silt/clay makes it more dense so that the effect when it meets the salt water is not so clear). You can still do this with the vertical pipe, without needing the pipe from the side - but the pipe from the side adds the realism of a river flowing in from side.

Wonderful feedback - many thanks to both you and your daughter!