

River discharges, ocean circulation and material transport in Japanese coastal waters: simulation with JCOPE ocean model

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The total volume of fresh water discharged by rivers into the world ocean is incompatible with the total mass of ocean waters; however these discharges contribute significantly into formation of fresher coastal waters and details of coastal ocean circulation.

This impact is not local, and supports presence of lower salinity waters in wide coastal areas along Japanese coast. In an absence of rivers in ocean model for appropriate reproducibility of ocean surface salinity it is often required to apply salinity restoration approach. Additionally, rivers could bring to ocean surface-floating, suspended and dissolved substances, some of which are hazardous, like radioactive materials initially dropped on the ground following such disasters as Fukushima Dai-Ichi nuclear power plant accident. These could be washed to rivers by strong rainfalls.

Method of counting inflow of fresh water from rivers as horizontal fluxes to the designated model cells is used. Demonstrated are direct impacts of rivers on formation of fresher waters along the coast of Japan and some cases of induced by discharges local ocean circulation patterns near the river mouth locations. A preliminary experiment when the model utilizes the hourly information on the amount of river discharges demonstrates an importance of such approach for the correct simulation of transport processes in extreme conditions like the typhoon-induced precipitations that often take place in Japan and East Asia. For achieving of this capacity, we are looking for utilization of simple land waters hydrological models for main river basins that could transfer the detailed meteorological precipitation forecast information into the approximate forecasts of river discharges.

Keywords: river discharge, ocean circulation, river-ocean interaction, coastal ocean processes