

The relation between exchange flow and diahaline mixing in estuaries

Hans Burchard, Knut Klingbeil, Xaver Lange, Xiangyu Li, Marvin Lorenz, Parker MacCready, Lloyd Reese

Estuaries are coastal water bodies connecting rivers to the ocean by mixing riverine freshwater with inflowing saline ocean water such that outflowing brackish water is generated. To provide the upper parts of estuaries with salt from the ocean, a landward salt transport against the river flow is required, the so-called estuarine circulation. Our study derives a time-averaged relation that quantitatively connects the estuarine mixing and the estuarine circulation in a two-way manner as opposed to the common notion of circulation depending on mixing. This relation is demonstrated for numerical models of two estuaries, a tidal estuary with a simple two-layer circulation and a non-tidal estuary with a three-layer circulation driven by high temporal variability of offshore salinity.