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# Alongshore and offshore volume transports related to upwelling regions in the Baltic Sea

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Up- and downwelling are typical phenomena of the Baltic Sea. Because of the complex coastline and many islands, wind from any direction causes up- and downwelling near the coast. The extent of upwelling is scaled by the internal Rossby radius which is about 2-10 km in the Baltic Sea. During summer and autumn when the sea surface is warm, upwelling can be observed as a local temperature drop of several degrees by infrared satellite measurements. Cold water from below the thermocline is lifted upwards and eventually reaches the surface, where it replaces a well-mixed and considerably warmer upper layer. Upwelling is forced by sudden storms or strong wind events form different directions, with typical time scales ranging from a few days up to weeks. Satellite data indicate that the horizontal scales of coastal upwelling are of the order of 100 km alongshore and some 10-20 km in the direction out from the coast. Sometimes upwelled water is spread several tens of kilometers out into the basin, forming filaments of cold water.
Different upwelling events occurring in 1997, 2006 and 2008 have been analyzed and compared. Satellite images have been used to identify strong upwelling along the coast and to estimate the proper temporal range as well as the extent of the affected area. The different upwelling events have been further analyzed by utilizing modeling results of a coupled sea ice-ocean model. From the numerical model simulation the upwelling process can be analyzed in detail and the corresponding volume transports along- and offshore the coast can be determined, thus quantifying coastal upwelling.