



A statistical approach on upwelling in the Baltic Sea based on the analysis of satellite data for 1990–

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A statistical analysis of Baltic Sea upwelling has been carried out to cover, for the first time, the entire sea area for the period 1990–2009. Weekly composite SST maps based on NOAA/ AVHRR satellite data were used to evaluate the location and frequency of upwelling. The results obtained were analyzed and compared with earlier studies, including both measurements and modeling with an excellent agreement. Our study enables to evaluate the most intense upwelling areas in the entire Baltic Sea. According to the analysis of 443 SST maps, among the most common upwelling regions are found at the Swedish south and east coast (frequency 10–25%), the Swedish coast of the Bothnian Bay (16%), the southern tip of Gotland island (up to 15%), and the Finnish coast of the Gulf of Finland (up to 15%). Pronounced upwelling occurs also at the Estonian coast and Baltic east coast (up to 15%), the Polish coast and west coast of Rügen island (10–15%), otherwise upwelling frequency was between 5 to 10 %. Additionally, simulated SST distributions derived from a Baltic Sea numerical model have been analyzed for the same

period. Furthermore, at specific positions close to the coastline, surface winds based on the SMHI meteorological data base have been analyzed for the same 20-year period. Wind components parallel to the coast have been discriminated into favorable and unfavorable winds forcing upwelling. The obtained frequencies of upwelling favorable winds fit very well with observed upwelling frequencies derived from satellite SST maps. For the period 1990-2009 a positive trend of upwelling frequencies along the Swedish east coast and the Finnish coast of the Gulf of Finland was calculated.