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Influence of atmospheric forcing and freshwater discharge on interannual variability of the vertical diffuse attenuation coefficient at 490 nm in the Baltic Sea

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Each year spatial patterns of ocean color in the Baltic Sea differ in temporal evolution and magnitude. We have investigated the interannual variability of the spatially averaged vertical diffuse attenuation coefficient at 490 nm, Kd(490), in response to atmospheric forcing and river discharge. Our results indicate that atmospheric forcing does not have a significant influence on the interannual anomalies of Kd(490) in the Baltic Sea. This is in contrast to the North Atlantic site located at similar latitudes, were interannual variability of phytoplankton blooms (and ocean color) is to a large degree controlled by a local weather. Instead, in the Baltic Sea, the interannual variability of Kd(490) is significantly influenced by the river runoff. Higher values of Kd(490) are observed in years with larger inflow of water from rivers. Without an access to more detailed information about the concentrations of various optically significant water components, we can only speculate about the possible reasons for this correlation, but it is most likely a combination of several factors. These include: development of more intense phytoplankton blooms associated with larger supply of nutrients delivered by rivers, advection of optically important material with river water, as well as different physical condition for phytoplankton growth due to more stable water stratification. The diffuse attenuation coefficient plays a critical role in many oceanographic processes. For example, Kd is essential for quantification of radiative heating of the ocean, in models of primary production and other photoprocesses, and in studies discussing water turbidity and water quality. Better understanding of the variability of Kd in the Baltic Sea can impove our knowledge of this marine environment.