**Effects of cloud adjacency on TOA radiance and ocean color products: A statistical assessment**

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**Abstract:** Ocean color measurements near clouds suffer from the cloud adjacent effects (AEs), leading to ~50% of the cloud-free ocean data flagged as low quality. Yet, quantitative assessment of such effects is not available, not to mention how to minimize or correct them. The goal of this study is therefore to quantify such effects on top-of-atmosphere (TOA) radiance and ocean color data products for MODIS/Terra, MODIS/Aqua, and SeaWiFS measurements. The estimation was based on statistics and an objective method applied to carefully selected clear-water scenes (N>20 for each instrument), where the ocean properties are relatively homogeneous. The AE was quantified as the relative difference between the near-cloud pixels and pixels at least 20 km away from any cloud. Results show that the AEs on TOA radiance share similar patterns among the three missions, which decrease sharply with increasing distance from cloud edges, and the AEs increase monotonously with increasing wavelengths. Disenable memory effects (MEs) are also observed on cloud-adjacent pixels of both MODIS measurements following the scan directions, representing >15% of the total adjacency effects in TOA radiance. The AEs on the retrieved remote sensing reflectance (Rrs) data products are different among the three missions, leading to different patterns in the chlorophyll-a (Chl-a) and normalized Florescence Line Height (nFLH) data products. Large AEs (>50%) are observed in nFLH of both MODIS measurements, likely due to the opposite AEs on Rrs between 667 and 678 nm. Finally, when the OCI Chl-a algorithm is used, the current MODIS stray-light masking window (5x7) to remove the AEs can be relaxed to 3x3 without sacrificing data quality, leading to >40% of the previously masked low-quality data being recovered.

**Keywords:** Cloud adjacency effects, Memory effects, Stray light, Ocean color, TOA radiance, Remote sensing reflectance (Rrs), Chl-a, OCI, MODIS, SeaWiFS