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Examining the 10-year variabiltiy in DOM photochemistry from SeaWiFS data

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Long term and large-scale trends in photochemical carbon transformations are difficult to quantify. Scaling from laboratory results to oceanic estimates is confounded by temporal and spatial variability in photochemical drivers (radiation, CDOM absorbance, and quantum yield). Remotely sensed ocean colour, a reflection of photon absorbance, allows new insight on the quantitative importance of photochemistry over temporal and spatial scales that were previously unknown. Carbon monoxide, a product of the photochemical breakdown of dissolved organic matter (DOM), serves as a useful model for the photochemistry of other carbon components which also depend on photon absorbance by the 'colored' components of the DOM pool (CDOM). Our new optical models, SeaUV and SeaUVc, tuned specifically to use remotely sensed visible data to estimate both spectral CDOM absorbance and downwelling UV attenuation, are used to drive marine photochemical models relevant to DOM biogeochemical cycles. Here we examine a 10-year global SeaWiFS data set for seasonal and spatial variability in depth-resolved DOM photochemistry using CO as an example. Using published relationships for photoproduction and loss terms for CO together with remotely sensed and climatological data (mixed layer depth, temperature, wind speed, etc.) we evaluate the production and loss of CO by air-sea exchange or *in situ* consumption as a test for operational global and regional models. This exercise identifies holes in present approaches and areas for new research. Time series analysis of the data set also shows downward trends for CDOM absorbance in diverse, yet distinct oceanic locations, indicating changes in the depth of photochemical production over the 10-year SeaWiFS data set.