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Spatial and Seasonal Patterns of Natural Organic Matter Spectral Fluorescent Signatures in Lake Kinneret (Sea of Galilee) and its Catchment Basin

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This paper presents a characterization of fluorescent natural organic matter (NOM) in Lake Kinneret (Sea of Galilee) and its catchment basin. Lake Kinneret, the large high-productive subtropical lake, is the only freshwater lake and one of the major water resources in Israel. The work is based on the analysis of the spectral fluorescent signatures (excitation emission matrices; EEM) of 167 water samples collected between 2/2005-9/2006 and examined using parallel factor analysis. By examining relationships between different fluorescing components and probing their spatial and seasonal patterns, we aimed at learning about differences between lacustrian and riverine-originated NOM and differentiating between the various sources of organic matter in the lake.
Two humic-like and one proteinous components were sufficient to describe EEM variability among all the water samples. The two humic-like components showed essentially different relations in lake and riverine samples.
The vertical distributions of humic-like components in Lake Kinneret are indicative of seasonal lake stratification. When the humic-like matter stratification is established, the concentration of humic-like substances is greater in the bottom water layers than in the surface. At the layer closest to the sediments, the concentration of humic-like components increases also with time (at anoxic conditions) thus linking their production to NOM transformation in the bottom water layer and/or to its release from sediments.
Depth-related distribution of humic-like components appears to be similar in different lake locations thus (i) indicating the important role of a distance from the water surface in the vertical distribution of humic-like matter and (ii) supporting a possible influence of photodegradation on the concentrations of humic-like components in the upper water layers. Vertical distribution of the proteinous component, which reflects biological activity at the upper water layers, did not correlate with that of the humic-like components. Dissolved organic carbon concentrations did not show any vertical stratification, emphasizing the power of EEM to explore NOM dynamics.