



## Patterns and regulation of dissolved organic carbon: An analysis of 7,500 widely distributed lakes

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**ABSTRACT:** Dissolved organic carbon (DOC) is a key parameter in lakes that can affect numerous features, including microbial metabolism, light climate, acidity, and primary production. In an attempt to understand the factors that regulate DOC in lakes, we assembled a large database (7,514 lakes from 6 continents) of DOC concentrations and other parameters that characterize the conditions in the lakes, the catchment, the soil, and the climate. DOC concentrations were in the range 0.1-332 mg L<sup>-1</sup>, and the median was 5.71 mg L<sup>-1</sup>. A partial least squares regression explained 48% of the variability in lake DOC and showed that altitude, mean annual runoff, and precipitation were negatively correlated with lake DOC, while conductivity, soil carbon density, and soil C:N ratio were positively related with lake DOC. A multiple linear regression using altitude, mean annual runoff, and soil carbon density as predictors explained 40% of the variability in lake DOC. While lake area and drainage ratio (catchment : lake area) were not correlated to lake DOC in the global data set, these two factors explained significant variation of the residuals of the multiple linear regression model in several regional subsets of data. These results suggest a hierarchical regulation of DOC in lakes, where climatic and topographic characteristics set the possible range of DOC concentrations of a certain region, and catchment and lake properties then regulate the DOC concentration in each individual lake.

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