Geophysical Research Abstracts
Vol. 18, EGU2016-17952, 2016
EGU General Assembly 2016

Fluorscence signatures of dissolved organic material in an alpine lake ecosystem: responses to interannual climate variation and nutrient cycling

Diane McKnight, Matt Olivier, and Katherina Hell
University of Colorado, INSTAAR, Boulder, Colorado, United States (diane.mcknight@colorado.edu)

During snowmelt alpine lakes receive lower concentrations of dissolved organic material (DOM) that originates from the surrounding watershed than sub-alpine and montane lakes at lower elevations. Alpine lakes also have a shorter ice-free period that constrains the summer season of phytoplankton growth. Nonetheless, previous study of the reactive transport and production of DOM in an alpine lake in the Colorado Front Range during snowmelt and the summer ice-free season has shown that changes in DOM sources and the influence of biogeochemical processes can be resolved using fluorescence spectroscopy. Here we examine inter-annual variations in DOM fluorescence signatures during the snowmelt and summer periods in comparison to records of climate, residence time and primary production in the lake during the summer. Our analysis shows that variation in chlorophyll a concentration is a driver for variations in the fluorescence index (FI), as well as for specific ultra-violet absorbance. This result supports the predictions from the previous reactive transport modeling. We also conducted mesocosm experiments with nutrient enrichment to explore the role of nitrogen and phosphorus availability in influencing the fluorescence signature of DOM in summer. These results suggest that monitoring of simple spectroscopic properties of DOM can provide a means to track the biogeochemical consequences for alpine lakes of “too much” summer as climate continues to change.