Geophysical Research Abstracts
Vol. 19, EGU2017-5771, 2017
EGU General Assembly 2017

High frequency observations of temperature and oxygen in a large Canadian lake over two winters reveal differences between a severe and a mild winter.

Bernard Yang (1), Mathew Wells (1), Joelle Young (2), and Laura Brown (1)

(1) University of Toronto, Toronto, Canada , (2) Ontario Ministry of the Environment and Climate Change, Toronto, Canada

High-frequency observations of thermal structure under the ice of a large lake over the winter of 2015 and the winter of 2016 reveal the presence of large (10-20 m) overturning convection cells, driven by diurnal solar heating penetrating the ice cover. The most vigorous convection occurred near the end of winter, which our model suggest is the time that the ice melted, thinned and became transparent. This convection lead to a deepening of the mixed layer over time. During the same period the dissolved oxygen had become super-saturated from the surface to 23 m below the surface, suggesting abundant algal growth. Thorpe scale analysis of our high frequency temperature measurements, revealed that very large scale mixing occurred beneath the ice. This mixed layer depth increased during the melting period, and mixing was most active during the day. Air temperatures of the 2016 winter was significantly warmer than the 2015 winter. The lake experienced a persistent ice cover over the severe winter of 2015, but an intermittent ice cover over the mild winter of 2016. Comparing data from these two winters suggest that solar radiation and ice cover are critical for the dynamics and oxygen budgets in the many northern ice covered lakes.