BIG HEAT, BIG CHILL:
IMPACT OF CLIMATE CHANGE ON THE THERMAL REGIME OF LAKE SUPERIOR

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The Great Lakes have, in rapid succession, experienced climatic 'bookend' years: the unusually warm 2012 season ("Big Heat") and the extreme cold of 2014 ("Big Chill").

Impacts of these two ‘bookend’ years on the thermal regime of Lake Superior were observed and characterized, thereby offering insights regarding the potential response of the lake to long-term climate change.

Summary

Lake-wide Average

- Warmerest year on record in USA
- In summer 2012, satellite derived lake-wide average surface temperatures were 5-8 deg. C warmer than the decadal average

Nearshore
- Early onset of stratification and a deeper thermocline

Offshore
- Representation of the stratified period and upper mixed layer depth for an average year

Lake-wide Average

- Winter of 2010-2011: Representative of an average year
- Maximum ice cover reached 35%

Nearshore
- Delayed timing of stratification with a shallower thermocline

Offshore
- Satelite derived lake-wide average surface temperatures in the summer of 2011 agreed well with the decadal average

Lake-wide Average

- Seasonal air temperature pattern in 2011
- Changes in air temperature influence summer thermal dynamics (Austin and Colman 2007)

Nearshore
- Coldest year in over 20 years on record
- In the short summer of 2014, the lake was slow to warm up and lake-wide averaged surface temperatures remained 3-5 deg. C below the decadal average

Offshore
- Extreme cold winter of 2013-2014
- Maximum ice cover reached 95.7%
- Frozen Spring: When the ice on Lake Superior didn’t melt

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