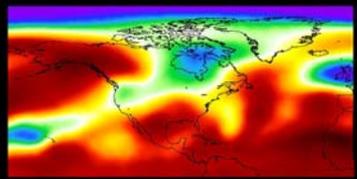


NAO impact on summer winds over the past 9500 years as recorded by Diatoms in Lake du Sommet in southern Québec, Canada



Credit: NASA/ESA **Sonja Hausmann, University of Arkansas, Falko Fye, University of Arkansas, Guillaume St-Onge, ISMER/GEOTOP, Reinhard Pienitz, ULAVAL**

Gridded correlation analysis between 500mbar geopotential heights and solar activity June 1948 to 2006. In the subtropics, solar activity and heights are correlated

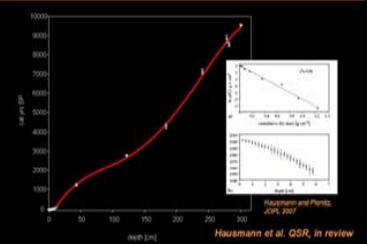


Gridded correlation analyses revealed that diatom flux, diatom inferred circulation, observed June wind velocity, the June NAO index, and observed solar activity are significantly linked to higher June 500hPa geopotential heights in the southern North Atlantic and lower 500hPa heights in northern Quebec. During the Holocene, diatom production, species composition and the diatom inferred circulation of the water column of Lac du Sommet, a small lake in southern Quebec, were all strongly related. A high resolution study of the past 40 years showed that diatom production of this lake varies according to observed wind and solar activity. The 9500 year diatom record shows 930 and 2100-year periodicities, previously observed in independent solar proxy records. During the past 9000 years, solar activity explained 40% of the overall diatom changes, diatom production and diatom-inferred lake circulation, and 46% of the variance in the dominant diatom taxon *Fragilaria virescens*. Our results suggest that solar activity intensified the south-north pressure gradient and led to increased June wind activity in southern Quebec. Higher wind activities were inferred from 5000 to 4000 cal BP, 3000 to 1500 cal BP, and for the past 200 years.

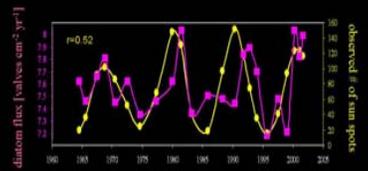
Coring of 3.3 m sediments in 2002



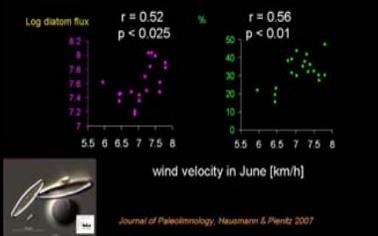
Depth age model for lac du Sommet based on ²¹⁰Pb and ¹⁴C dates



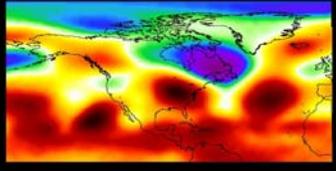
Solar activity and diatom flux were correlated during the past 40 years



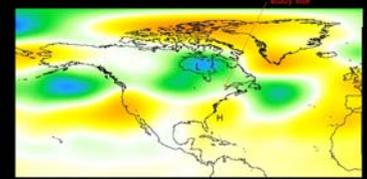
Diatom flux and *Fragilaria virescens* are correlated with wind



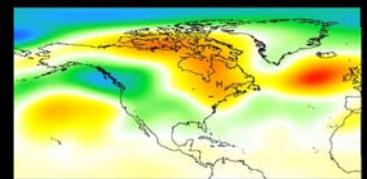
Gridded correlation analysis between 500mbar geopotential heights and wind in June in Quebec from 1948 to 2006. Wind in Quebec is **correlated** with 500mbar heights in the subtropics



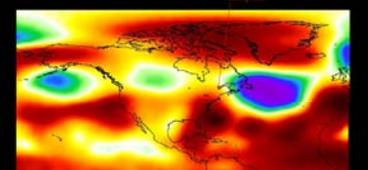
500mbar June composite of 6 years of max diatoms flux. Strong N-S pressure gradient leads to enhanced wind, stronger lake circulation and higher diatom production



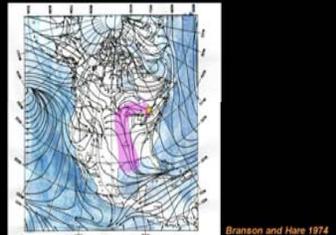
500mbar June composite of 6 years of min diatoms flux. Reversal of composite analysis. Less wind, weaker lake circulation and reduced diatom flux



Correlation analysis between 500mbar geopotential heights and diatom flux of Lac du Sommet from 1965 to 2002. Diatom flux is **correlated** with 500mbar heights in the subtropics



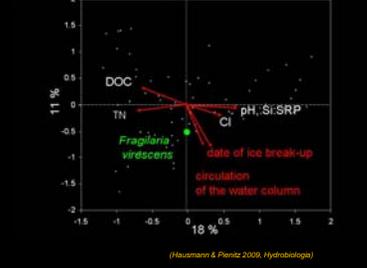
In summer clockwise wind flow around the Bermuda High extends up to Hudson Bay



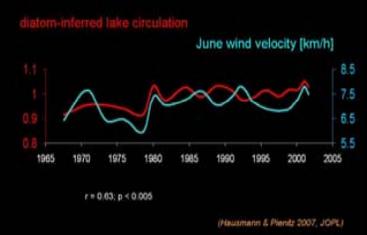
Biweekly sediment trap and water chemistry samples in 4 lakes along an elevation gradient



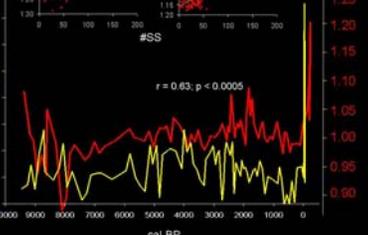
CCA of summer trap samples (Species enrichment 30%)



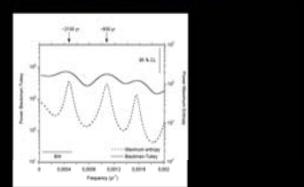
Inferred lake circulation is correlated to wind



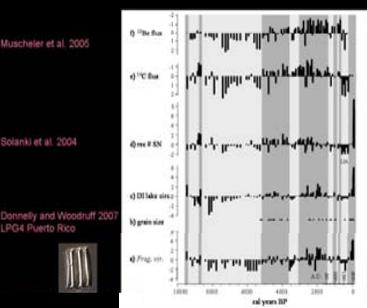
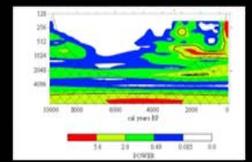
Diatoms show 2100 and 930 year cycle



Significant only after climate optimum



Conclusions



Solar activity is related to a south-north pressure gradient, which leads to **wind**
 Lake circulation is correlated to wind
 During the past 9500 years rec. # of **Sunspots** and diatom inferred **Lake Circulation** were significantly correlated
 Highest Lake Circulation was inferred during the past 100 years

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