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A late Holocene diatom record from the Laurentian Fan reveals the imprints of solar forcing over oceanic circulation changes

I. Gil (1,2,3), L. Keigwin (2), F. Abrantes (1), and D. Hebbeln (4)

(1) LNEG, Marine Geology Unit, 2721-866 Alfragide, Portugal (isabelle.gil@lneg.pt), (2) Woods Hole Oceanographic Institution, Woods Hole, USA, (3) CIIMAR, Porto, Portugal, (4) MARUM, University of Bremen, Bremen, Germany

The North Atlantic is recognized as a main regulator of present day climate, with its oceanographic changes affecting directly the climate of both sides of the North Atlantic. High resolution diatom analyses on a multicore from the Laurentian Fan were carried out to assess the surface oceanic variability of the last two millennia. The Laurentian Fan site is comprised in the Slope Water Region, where waters from subpolar and subtropical origin meet. Nutrients are provided to the system by the Western Boundary Current through the Warm Slope Waters associated with the Gulf Stream. As diatom abundances can be regarded as a good proxy of surface water productivity, we expect that the present diatom record describes the circulation over the site through the productivity conditions.
Our study show that increased diatom production is associated with warm waters (in particular since AD 820), as generally occurring during solar minima. Additionally, diatom abundances present a century scale frequency in the range of the solar Gleissberg cycle. As nowadays a local warming is also observed over the site during negative North Atlantic Oscillation - NAO situations, it appears that solar minima likely promoted NAO negative situations, associated with a local warming and increased productivity conditions. The relationship between the NAO and solar activity has already been established based on recent instrumental data set and mainly for specific historical solar minima. The present study reveals the sensitivity of the surface oceanic circulation to solar variability for at least the last two millennia.