



## **Late-Holocene record of environmental changes in the Ross Sea: from seasonal to centennial time scales**

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We present data from a laminated sediment core collected in the Edisto inlet (Ross Sea, Antarctica). The expanded record (14.6 m long) covers the last ca. 2800 years and it is dominated by dark- and light-brown diatom oozes. We used a suite of proxies which include diatom assemblages, bulk OC and TN, nitrogen and carbon stable isotopes, opal, grain size and biomarker analyses with focus on the new IPSO-25 proxy (di-unsaturated highly branched isoprenoid) of landfast sea ice.

A sub-sample of well-defined dark and light laminae (n=33) exhibited a statistically different (t-test) composition in terms of stable carbon isotopes, IPSO-25, relative percentage of the diatom *Corethron pennatum*, as well as porosity. Dark laminae are likely indicative of spring blooms when the delta-13C signature and IPSO-25 concentration are high, whereas porosity is comparatively low. The heavy delta-13C signature and high IPSO-25 values are consistent with deposition of sea-ice diatoms growing in reduced availability of dissolved inorganic carbon typical of sea-ice matrix. By contrast, the IPSO-25 in light laminae decreases by up to three-orders of magnitude together with a marked decrease of delta-13C. We interpret these trends to reflect a protracted opening of the bay later in summer and a greater availability of carbon for photosynthesis. Under these conditions, the greater *Corethron pennatum* concentration in the light-brown laminae might indicate a different environment likely associated with open water conditions. In addition, the relatively higher abundance of *Corethron pennatum* resulted in a “sponge-like” matrix which explains the marked difference in porosity between light and dark laminae.

The same suite of parameters were then analysed throughout the sediment core (n=300). Spectral analysis of the core data revealed a pervasive and persistent cyclicity at ~90 years consistent with the Gleissberg solar cycle. Based on the information gained from the laminae analysis, we infer that through a top-down effect solar activity might influence regional wind patterns, which in turn exerts first-order control on the landfast sea ice dynamics and diatom ecology in the Edisto Inlet.