Bennettites as CO_2 proxy for the Mesozoic?

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The inverse relationship between the stomatal density of plant leaves and atmospheric CO_2 concentrations is well documented. This relationship is group specific and not universally applicable, but does establish plant cuticles as a strong proxy for (palaeo-) atmospheric concentrations of CO_2. In the current study, CO_2 concentrations across the Triassic-Jurassic boundary (200 million years ago) of Asterteklø ft in Jameson Land, East Greenland, are being reconstructed. This boundary is defined by one of the "big five" mass extinctions of the Phanerozoic and a massive floral turnover. There is some evidence for a high CO_2-induced global warming inferred from various proxies, including Ginkgoales stomatal numbers. The need to refine the CO_2 record by obtaining abundant and high-resolution data using plant cuticles across the boundary has been hampered by the large proportion of singletons, variable preservation, and by the scarcity of Ginkgoales cuticles. Bennettites (an extinct group of Mesozoic plants morphologically similar to cycads), particularly the form genera *Anomozamites* and *Pterophyllum*, are extremely common and well preserved in the Astarteklø ft strata and could potentially provide a rich source of data for a high-resolution CO_2 reconstruction. The applicability of Bennettites in palaeo-CO_2 reconstruction is tested here for the first time. The results of our study and their implications will be discussed.

A new data base for deriving long-term oxygen trends in the North Atlantic

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Oceanic oxygen is one of the most powerful tracers to detect changes in biological and physical processes in the ocean. This is not at least because its measurement has a long history, permitting us to extend the observational record back in time for several decades. But due to the sparsity of hydrographic observations as well as due to strongly varying qualities of the data, estimating long term trends in the oceanic inventory are difficult [1]. We thus need to make a special effort to collect all possible historical O_2 data and then to apply secondary quality control (QC) procedures in order to obtain an internally consistent database [2, 3].

We are in the process of combining the recently assembled CARINA (CARbon IN Atlantic Ocean) data base with other datasets (e.g. HydroBase2) in order to produce an optimal dataset for studying long-term trends in the Atlantic Ocean. The goal is to synthesize all the available O_2 data over the last four decades and to describe how the O_2 concentration has changed with time across the entire North Atlantic.

CARINA is a collection of 185 hydrographic cruises or projects, and has been assembled recently with the goal of creating a large collection of ocean interior data directly or indirectly linked to the carbon cycle, including O_2 concentrations [4]. Hydrobase2 was assembled by Ruth Curry, primarily with the goal to assess changes in temperature and nutrients. Because both data sets consist of data collected by many different laboratories over several decades and often using different methods, these data need to be carefully quality controlled in order to obtain high-quality datasets that are useful for describing the large-scale distribution of properties. We have finished the secondary quality control for the CARINA database, and are now in the process of undertaking the secondary quality control for Hydrobase2 in order to ensure consistency between both datasets. First preliminary analyses of the data indicate substantial large-scale changes, whose large-scale coherency is not well established yet.

[1] Hamme & Keeling (2008), *Tellus* **60B** 706–717. [2] Key *et al.* (2004), *Global Biogeochem. Cycles* **18**. [3] Johnson *et al.* (2001), *J. Atmos. and Oceanic Technol. 18* 1234–1244. [4] Stendardo *et al.* (2009), *Earth Syst. Sci. Data* in prep.