Rhenium-Osmium dating of black shales from the Neoproterozoic Shaler Supergroup, Victoria Island, Canada

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The Neoproterozoic Shaler Supergroup from Victoria Island, Canada, is a diverse sequence of sandstone, carbonate, evaporite and shale that was deposited in an intracontinental basin within the supercontinent Rodinia. The ~ 4km-thick succession was intruded by diabase sills and dykes of the ca. 720 Ma Franklin igneous event, which provide a minimum depositional age for the Shaler Supergroup. Its maximum depositional age, from detrital zircon geochronology, is about 1000 Ma. The Shaler Supergroup has been used as a reference section for global $^{87}Sr/^{86}Sr$, $\delta^{13}C$ and biostratigraphic correlation of Neoproterozoic sedimentary successions, notably with the Canadian Mackenzie Mountains Supergroup and the Australian Bitter Springs Formation.

Whereas global chemostratigraphic correlations are better established in the late Cryogenian and Ediacaran, precise age information for the late Tonian and early Cryogenian Periods that encompass the Shaler Supergroup is scarce. The Wynniatt Formation of the Shaler Supergroup has been correlated to the ~830 Ma Gillen Member of the Bitter Springs Formation in Australia based on lithostratigraphy and matching low $^{87}Sr/^{86}Sr$ from carbonates.

Recent advances in Re-Os geochronology allow for direct dating of black shales as a tool for chrono-stratigraphic correlation of sections where other chronostratigraphic and biostratigraphic information are lacking. In order to constrain the depositional history of the Shaler Supergroup, Re-Os analyses were obtained from core and outcrop samples of black shale from the Wynniatt and Boot Inlet formations collected from the Minto Inlier of Victoria Island.

Black shales from the Wynniatt Formation, several hundred meters below the contact with ~720Ma basalts that mark the top of the Shaler Supergroup, yield preliminary Re-Os ages around 770 – 790 Ma. Samples from the Boot Inlet Formation, about 1 km stratigraphically below the Wynniatt Formation, yield Re-Os ages around 900-920 Ma. These ages provide additional valuable anchor points for the Neoproterozoic timescale.

Old and new geochemical proxy evidence for deciphering the southern high latitude 'doubthouse'

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Antarctica is the least explored continent on our planet Earth, largely due to today's massive ice cover on the continent, reaching a thickness of 4500 m in places, leaving only 0.3% of the land area uncovered. This ice sheet, however, was not always in place, and its inception ~34 million years ago at the Eocene-Oligocene boundary marked one of the most fundamental climate transitions in recent Earth history: the transition from the greenhouse world of the Cretaceous and early Paleogene to the icehouse world we are currently living in.

Global climate in the greenhouse world seems to have been characterized by low latitudinal temperature gradients and subtropical temperatures at high latitudes. Atmospheric CO_2 levels were probably well in excess of 1000 ppm, and it is hypothesised that there was no or only very little ice on the poles. A range of geochemical proxies have been used over the years to characterize baseline conditions as well as rapid climate excursions during the 'doubthouse' (ca. 144 to 34 Ma).

Here I will provide a summary and critical evaluation of some of the proxies that can shed light on the interrelationship between Earth's cryosphere, ocean chemistry and temperature, and the carbon cycle. I will pay particular attention to the early Paleogene in the southern high latitudes and to evaluating the use of radiogenic isotope systems (i.e., Hf, Nd, Pb isotopes). I will furthermore highlight some of the spectacular initial results obtained from material recovered during IODP Expedition 318, which sailed in January to March 2010 to the Wilkes Land coast, East Antarctica. Seven sites were drilled along an inshore to offshore transect, yielding ~2000 m of middle Eocene to Holocene sediment. At Site U1356, a partial record of the early Paleogene was retrieved (Expedition 318 Scientists, 2011), offering the rare opportunity for detailed geochemical studies on a marine section from the southern high latitudes during this time.

[1] Expedition 318 Scientists (2011). Site U1356. *In* Escutia, C., Brinkhuis, H., Klaus, A. and the Expedition 318 Scientists, *Proc. IODP*, **318**: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.318.104.2011.