Using local and global effects on a high-resolution ^{14}C record to constrain climate change forcing and ice sheet response from Vancouver Island, Western Canada

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We present a high-resolution ^{14}C record for MD02-2496 (48°58.5N;127°02.1W; 1243m water depth), collected from the Vancouver Island continental slope. 46 AMS ^{14}C dates have been generated from both planktonic foraminifera carbonate and bulk sedimentary organic carbon. Similar ^{14}C ages recorded in foraminiferal carbonate and the largely marine bulk sedimentary Corg are observed during non-glacial intervals. However, during the last glacial as the Cordilleran Ice Sheet (CIS) became proximal to the site, paired Corg and carbonate ^{14}C ages demonstrate significant differences (<4.5 kyr) as the terrestrial Corg content increased. This old terrestrial carbon input may account for non-constant □*R*s estimated for southern British Columbia estuarine regions during the last glacial.

A second important observation from this record is the presence of two ^{14}C plateaus during deglaciation (~13.3 and ~14.8 ^{14}C kyr BP). After correcting for estimated local surface ocean ^{14}C reservoir ages (>807 years), these plateaus coincide with global ^{14}C plateaus (12.2 and 13.3 ^{14}C kyr BP). Due to rapid atmospherc mixing, ^{14}C plateaus should be geologically instantaneous, allowing for independent stratigraphic correlation of widely distributed paleoclimate records. These ^{14}C plateaus are currently recognized in the North Atlantic, Cariaco Basin, Santa Barbara Basin and the North Pacific.

The resulting chronology based on this ^{14}C record enables correlation of glaciomarine sedimentary sequences within MD02-2496, to well known terrestrial units associated with CIS advance, retreat, and non-glacial conditions over the last 50 ka and provides new insight into CIS processes. One significant observation is the coincidence of previously unknown ice-rafted debris events representing significant retreat of the western marine margin of the CIS with North Atlantic climate events. What drove CIS destabilization? Forcing appears to be external to CIS dynamics resulting from either eustatic sea level rise or episodes of atmospheric warming over North America.

Application of the Sm-Nd isochron method to dating of evaporitic and hydrothermal carbonates

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Evaporites from the Campina de Cima salt mine in Loulé (Algarve Basin, Southern Portugal) represent almost the entire succession of an evaporation cycle, from the magnesite-dominated carbonate facies at the basis to the remains of a potash seam at the top. The formation age of the evaporites, however, is uncertain (Permian or Jurassic). Chemically separated magnesites from the lowest part of the succession show subparallel chondrite-normalized patterns for the middle to heavy REE but variable fractionated middle to light REE. Sm/Nd varies between 0.4 and 1.0 with Nd concentrations mostly < 1 ppm. Magnesites of six samples yield a Sm-Nd isochron age of 155.2 ± 6.6 (2σ) Ma (MSWD 1.2) with an initial Nd isotope ratio corresponding to ε_{Nd} -10.6. This age is interpreted to indicate an Upper Jurassic formation of magnesite from primary carbonate in evaporites of Middle Triassic or early Permian age ($^{87}Sr/^{86}Sr$, $\delta^{34}S$ and $\delta^{18}O$ isotope evidence) due to burial metamorphism in the presence of percolating Mg-rich brines.

Genetic models for "Veitsch Type" sparry magnesite mineralizations in Paleozoic series of the Eastern Alps (Styria, Austria) assume either a syngenetic (sedimentary) origin or an epigenetic formation by metasomatic replacement in Eoalpine times. Chemically separated carbonate fractions of magnesite samples from the Breitenau mine situated in the low-grade Graz Paleozoic show consistent light-REE-depleted patterns with Sm/Nd between 0.36–0.75 and Nd concentrations ≤ 3 ppm. Sm-Nd dating yields an isochron age of 221 ± 16 (2σ) Ma (MSWD 0.9) with an initial Nd isotope ratio corresponding to ε_{Nd} -8.6. Disseminated organic and clay materials are enriched in the light REE (Sm/Nd < 0.3) and in part in total REE (Nd up to 200 ppm). Initial results of Sm-Nd dating of these materials support the isochron age of 221 Ma which is interpreted to date formation of the magnesite deposits by metasomatic replacement due to infiltrating residual brines originating from Upper Permian/Lower Triassic evaporites [1].

[1] Prochaska & Henjes-Kunst (2008) *GCA*, this volume.