

## Continental paleotemperatures from lacustrine carbonates in Asia and North America

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Cretaceous lacustrine strata may hold many clues for understanding Cretaceous continental climate. Lacustrine strata of Asia, for example, have been key to improving our record of the Cretaceous Terrestrial Revolution (avian and non-avian dinosaurs, early mammals and angiosperms are well represented in Early Cretaceous lacustrine units). Lacustrine strata are also excellent archives for climate data. Here we present new paleotemperature data from lacustrine strata from two continents: North America and Asia. The advance of clumped isotope paleothermometry has opened the continental realm to enhanced investigation of paleoclimate and paleoenvironments.

Samples from an important fossil bird locality in the Xiagou Formation, in Gansu Province, China were collected and investigated utilizing petrographic observations, powder x-ray diffraction, traditional stable isotopes and clumped isotope paleothermometry. The section is interpreted to span the early Aptian Selli event. Petrographic and XRD analyses indicated that the majority of the lacustrine carbonates are fine grained dolomites. Carbon isotopic compositions of these samples are enriched, ranging from +0.4‰ to +11.4‰ PDB. Oxygen isotopes range from -8.5 to -1.9‰ PDB, and clumped isotope values range from 0.652 to 0.707‰ compared to the absolute reference frame.

Lacustrine samples from the late Aptian to early Albian Ruby Ranch Member of the Cedar Mountain Formation of North America (Utah, United States of America) were recovered and investigated using petrography, XRD and stable and preliminary clumped isotope analyses. Carbon isotopic compositions range from -12.0 to +8.8‰ PDB; oxygen isotopic compositions range from -8.9‰ to +1.8‰ PDB and clumped isotope values range from 0.617 to 0.732‰. The carbonates present in the Cedar Mountain Formation seem to have a more complex diagenetic history with calcite, high Mg calcite, and dolomite present.

Clumped derived temperatures from the Aptian Xiagou Formation range 20.6 to 47.2°C. Clumped isotope derived temperatures from the Cedar Mountain Formation range from 18.5 to 40.2°C. Taking into consideration seasonal biases and filtering for later diagenetic phases, these temperatures are consistent for a Greenhouse climate in mid-latitudes (~35 to 40°N). In addition, the presence of abundant dolomite and enriched  $\delta^{18}\text{O}$  values suggests that the lakes experienced significant evaporative flux.