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U/Pb dating of subduction-collision in the Brooks Range: implications for Mesozoic geodynamics of Arctic Alaska

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The paleogeographic and geodynamic evolution of Northern Alaska is crucial to understand the connection between the Arctic and Pacific realms. The opening of the Canada Basin (CB) is debated both in terms of inception time (between 190 and 140 Ma) and driving mechanisms. The prevalent model assumes that CB opened in a back-arc position within the Arctic-Alaska-Chukotka (AAC) terrane following a change in subduction polarity from S- to N-dipping subduction The adjacent Brooks Range orogen (BRO) is thought to have formed when the Koyukuk volcanic arc collided with the southern extension of AAC. This collision therefore potentially provides key information for Arctic geodynamics, and for the mechanisms of CB opening, but neither the detailed timing of this collisional history nor its duration are well known.
In order to constrain the timing of the collision, we performed in-situ zircon U-Pb SIMS analyses on eclogites from the BRO s.l. (BR and Seward Peninsula), which indicate that peak burial (at 510 $\pm$ 60°C, 1.6 $\pm$ 0.2 GPa) during continental subduction and subsequent collision occurred at 141 $\pm$ 6 Ma (n=10, MSWD = 1.6). Eclogite metamorphism therefore postdates the initial rifting stage of the CB but predates effective sea-floor spreading. Younger zircon domains (114 $\pm$ 13 Ma) associated with retrograde assemblages could indicate a late thermal pulse or recrystallisation during exhumation in the collisional wedge. Combined with all available information on timing, these new age constraints are used to build a tectonic model for coeval evolution of the Brooks Range and the Canada Basin. The intra-Kingak "Jurassic Unconformity" at the Jurassic Cretaceous Boundary (Houseknecht, pers. communication) could actually be considered as the signature of the AAC-Koyukuk arc collision stage in the CB.