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A Mesoarchean Rifted Continental Margin in the Wyoming Province: Evidence for Supercontinent Breakup

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A Mesoarchean rifted continental margin in the Wyoming Province: Evidence for supercontinent breakup

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Bleeker [1] noted that Archean cratonic fragments preserved in the geologic record commonly show rifted or faulted margins, indicating that they were once parts of larger continental landmasses. These observations imply that the Wilson cycle began operating sometime in the Archean.

The Sacawee block in the southern Wyoming province consists of tonalitic gneisses and peraluminous high-K granitic gneisses. In depositional contact with these gneisses is a rift-drift cover sequence consisting of quartz arenite, pelitic schist, iron-formation, and metabasalt. We have obtained Nd isotope data, U-Pb crystallization ages on orthogneisses and detrital zircon U-Pb ages on quartzites from this cover sequence.

Sacawee gneisses have been dated at 3259 ± 8 Ma and 3232 ± 9 Ma, similar to ages of gneisses reported from the northern Slave province. Rhyolite and dacite from the Barlow Springs cover sequence that underlie voluminous metabasalts are 2.86-2.83 Ga, which is the same age as the inception of sedimentation in the Yellowknife supergroup. Stratigraphically above the Barlow Springs group is the Rattlesnake Hills group consisting of metabasalts and sparse rhyolite overlain by a thick graywacke sequence; a rhyolite has been dated at 2.72-2.73 Ga, which is similar to the age of greywackes in the upper portions of the Yellowknife supergroup.

One Barlow Springs group quartzite contains a single population of detrital zircon grains yielding a date of 2853 ± 6 Ma; three other quartzite samples from the Sacawee block lack this age population but contain 3.3 Ga zircons. The ~3.3 Ga age is similar to that found in quartzites from the northern Slave province.

In addition to similarities in the ages of Mesoarchean gneisses, the stratigraphy of the supracrustal rocks, and the detrital zircon spectra of paragneisses from the Slave and Wyoming provinces, both provinces are distinguished by Paleoarchean Nd model ages and radiogenic $^{207}Pb/^{204}Pb$ ratios. These similarities support Bleeker's hypothesis that both provinces were originally part of the supercontinent Sclavia and that continental breakup occurred ~2.85 Ga.

[1] Bleeker (2003) *Lithos* **71**, 99–134.

Development of a method to speciate gaseous oxidized mercury using thermal decomposition

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Despite the importance of gaseous oxidized mercury in the atmosphere and the global cycle, the dominant oxidation mechanisms and chemical forms remains unknown [1, 2].

We have developed a novel method for the qualitative identification of the chemical form of gaseous oxidized mercury (GOM). In this method, GOM is captured on an annular or tubular denuder similar to the technique which is currently used to quantify ambient GOM [3]. In the laboratory, the denuder is heated in a tubular oven with a carrier flow of UHP He. Gaseous Hg° emitted from the decomposing GOM is measured by laser induced fluorescence at 253.7 nm. The oven temperature is computer controlled and programmed to proceed through multiple heating steps. The varying decomposition rates as a function temperature for potential GOM compounds ($HgCl_2$, $HgBr_2$, HgO) produce a unique time signature for different compounds. Reference timeseries profiles have been generated by spiking with potential GOM compounds.

We have collected samples from a coal-fired power plant and from ambient air outside our laboratory on the south Florida coast. The 20 samples from the coal-fired power plant were collected during a test of varying bromine, chlorine, and ammonia concentrations. Ambient samples from outside our laboratory were collected on days with marine boundary layer influnce and strong solar UV. The analysis of these samples will be summarized and interpreted with regard to our current understanding of mercury oxidation.

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[1] Schroeder & Munthe (1998) *Atmos. Environ.* **32**, 809–822.
[2] Lin *et al.* (2006) *Atmos. Environ.* **40**, 2911–2928.
[3] Landis *et al.* (2002) *Environ. Sci. Technol.* **36**, 3000–3009.