Zircon LA-ICP-MS Ages Constrain Possible Jurassic True Polar Wander Event, Junggar Basin, Xinjiang, NW China

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The Junggar Basin Mesozoic section displays dramatic environmental shifts: from cold and wet in the Triassic-mid Jurassic, to warm and dry in the Late Jurassic, and back to wet in the Cretaceous - the type of changes recently ascribed to a dramatic latitude shift caused by true polar wander (TPW)(1). The goal of this study is to constrain the timing of this TPW so that climate changes can be compared across Asia and to the paleomagnetic temporal underpinning (2). We performed LA-ICP-MS, U-Pb zircon analysis on one sample from the coal-bearing fluvio-lacustrine Badaowan Fm. and another from the mostly lacustrine Sangonghe Fm. in superposition in the Haojiagou section, with paleontologically-based ages of Hettangian-Sinemurian and Sinemurian-Toarcian (Early Jurassic)(3). A thin (3 mm) ash in the lower Sangonghe Fm. has a preliminary maximum depositional age of ~193 Ma. A Badaowan volcanoclastic unit shows an age of ~300 Ma, too old because its basal part contains the Tr/J boundary at ~201 Ma (3). The Badaowan U-Pb age corresponds to ages seen for detrital zircons in prior studies in several younger Junggar units, with plausible sources being known Permian igneous rocks in the sediment source areas (4). The Sangonghe U-Pb age agrees with its paleontological age, independently constraining the Badaowan-Sangonghe boundary to ~193 Ma (mid-Sinemurian). Junggar strata show a change from cool and wet ~200 Ma, to warmer from ~193-170 Ma, and then back to wet before the much more dramatic shift to warm and arid in the Late Jurassic associated with the proposed TPW shift. While a precursor TPW latitudinal “jitter” is possible, a simpler argument is that an earlier moderate true climatic shift caused the ~193 Ma change. The Late Jurassic peak of aridity, more plausibly caused by the monster latitudinal TPW shift, is independently constrained by published LA-ICP-MS ages averaging ~156 Ma (4). Planned CA-ID-TIMS analyses will better constrain the timing of his shift with local paleomagnetic data strata being needed to test the climatic and TPW models.

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