The current state of glacial stratigraphy from the Gelasian to Chibanian stages in the Midwest United States

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Abstract

The repeated growth and decay of ice sheets in North American is the driving mechanism for sea-level change during the Quaternary. Problematically, most of the primary terrestrial records of glaciation in North America, i.e., old glacial diamictons, are eroded or covered by till deposited during the last or penultimate glacial episodes. However, one sector found in Nebraska, Kansas, Missouri, and Iowa was not glaciated during the last two stages, and the Quaternary package in this area can exceed 100 meters. Glacial diamictons in this region are difficult to distinguish in the field as the unweathered zones are generally gray, calcareous, and clay-rich. Though distinctions between tills made using normal or reversed magnatish and variation in the coarse clast fraction. Paleosols, weathering zones, or sand and gravel beds are commonly separate tills. Importantly, ash from the Yellowstone volcanic system can also be found between tills in certain locations. The tephras are from three separate events which occurred around 0.6 Ma, 1.3 Ma, and 2.1 Ma. Ages from cosmogenic-nuclide burial-dating on paleosols also indicate multiple distict advances; previous studies indicated at least six tills older than 0.2 Ma are present. New work analysing glacial signals left in the modern drainage network confirms that ice advanced into this area from the north via Minnesota rather than from the Great Lakes Region. Together, these terrestrial datasets and chronology represent critical parameters for models depicting previous iterations of North America glaciation - Ice lobes advanced past 40N over most of the Quaternary. Another implication is that Quaternary glaciation removed a significant volume of Phanerozoic strata from the North American Craton. Further work should be conducted to further constrain the timing of these ice advances and to potentially identify additional tills.

Keywords: Laurentide Ice Sheet, Glaciation, North America, Quaternary, Marine Isotope Stage, PreIllinoian

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