have been destroyed by extreme floods, chute cut-offs in coarse-grained meandering systems, and eolian activity.

Rooted vegetation and the Siluro-Devonian expansion of meandering rivers

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In a hypothesis first published in 1978, the increased prominence of meandering rivers in the mid Paleozoic was linked to the colonization of terrestrial environments by vegetation. We tested this hypothesis using a large literature dataset of Cambrian to Devonian fluvial deposits, with field examination of stratigraphic units in eastern Canada and elsewhere in Europe and North America. The results confirm the 1978 hypothesis, and show that Cambrian to Middle-Silurian rivers were braided, with a sharp increase in the abundance of meandering rivers during the Siluro-Devonian.

Previous authors had largely identified meandering systems on the basis of thick mudstones and organized channel deposits. However, our dataset suggests that lateral accretion sets, formed through systematic migration of point bars, are a robust proxy for the presence of meandering rivers. Lateral accretion is first recorded from small channels in Pridolian-Lochkovian strata (latest Silurian to earliest Devonian), but is noted in 40% of fluvial case studies by the Famennian (latest Devonian) in increasingly large channel bodies. This trend matches the known evolutionary record of rooted vegetation, as low, weakly rooted vegetation evolved into trees. We suggest that, as vegetation progressively stabilized river banks, channels were commonly constrained to single threads that migrated systematically, with stable floodplains that promoted the spread of animals into terrestrial settings.

The presence of meandering systems in the Precambrian record and on Mars and other extra-terrestrial bodies indicates that vegetation is not essential for meandering. If Cambrian to Silurian point-bars were originally present, they may largely