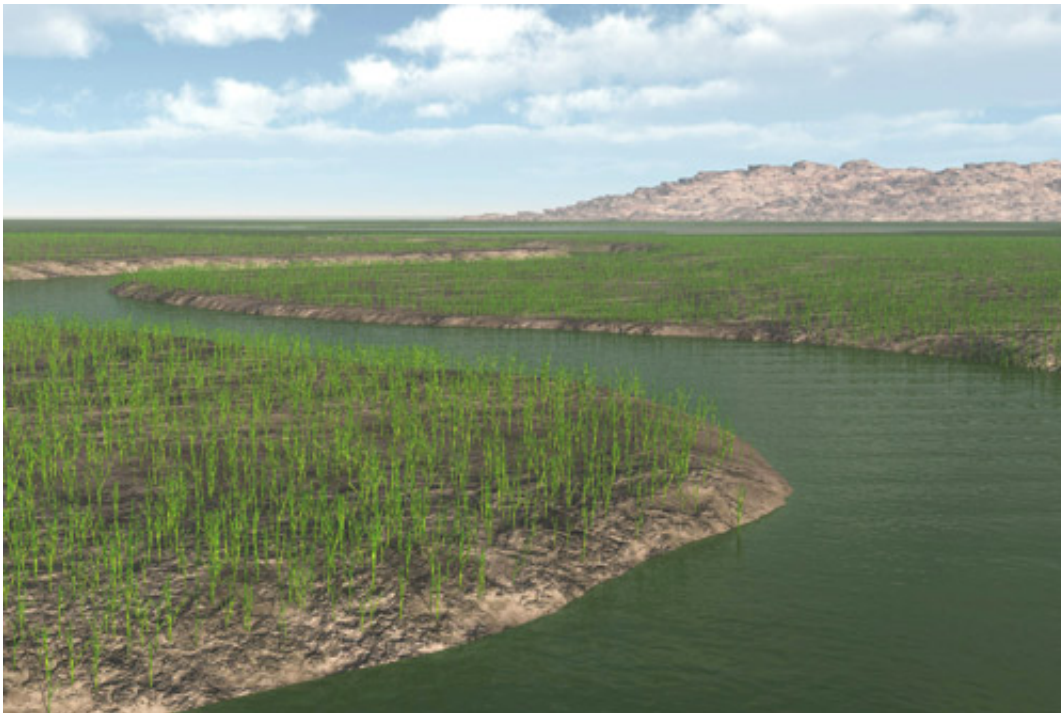


Evidence from China shows how plants colonized the land

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Early Devonian riverine landscape with plant community dominated by *Drepanophycus*, an early vascular plant. Credit: Zhenzhen Deng

New fossil finds from China push back the origins of deep soils by 20 million years, new research published today has uncovered.

This is a key part of the stepwise conquest of the land and transformation of the continents, researchers from the universities of

Peking and Bristol have discovered.

One of the greatest transitions in Earth history was the greening of the land. Up to 450 million years ago, there was no life outside water, and the land surface was a rocky landscape. Without plants there were no soils, and the rocky landscape eroded fast. Then the first tiny plants crept out of the water, and provided a green fringe. However, they could not venture far from the edge of the water.

By 390 million years ago, in the Middle Devonian, the first trees emerged. These early trees were only a few metres tall, but they could survive in soils away from the edges of rivers and streams. Importantly, they sent roots deep into the rocks, and helped develop thick soils, and the landscapes began to stabilize.

The new Chinese find, published today (8 August) in *Proceedings of the National Academy of Sciences*, is of deep rooting systems in Early Devonian rocks, from Yunnan in South China.

The study leader, Jinzhuang Xue from Peking University in Beijing, said: "We have been doing fieldwork in the Devonian rocks of Yunnan for some time, and we kept finding large-scale structures up to 1 metre deep in the red rocks. They looked like a plant called *Drepanophycus*, already known from rocks of the same age in Europe and North America."

The roots are typically 1 cm in diameter, and they branch continuously. They are tightly packed, with as many as 1000 roots in every square metre of sediment examined.

"These roots are found in deep soils, and in fact the two go hand in hand," said Professor Mike Benton of the University of Bristol, one of the co-authors. "Soils are made by plants and animals, and they have a

great stabilizing effect, taking up rainwater like a sponge and limiting erosion rates. From this time onwards, river systems changed their type, from fast-flowing, to slower-moving, meandering streams."

Measurements of the soil thickness and comparisons with modern floodplain soils suggest it may have taken 50–200 years for one [soil](#) bed to form, and nodules in the Chinese Devonian soils suggest that the stack of soils may represent a span of 10,000–200,000 years, a long time for landscape stability.

More information: Jinzhuang Xue et al. Belowground rhizomes in paleosols: The hidden half of an Early Devonian vascular plant, *Proceedings of the National Academy of Sciences* (2016). [DOI: 10.1073/pnas.1605051113](#)

Provided by University of Bristol

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