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Using modeling to investigate the biology of some of the oldest fossil trees.

presented by

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ABSTRACT

The apparition of the first trees and first forests in the middle Devonian (ca. 380 Ma) marked a key moment in plant evolution and are thought to have had an impact on terrestrial ecosystems at a global scale. The first trees appeared in two different groups of plants: the Pseudosporochnales, an extinct group related to the ferns, and the Archaeopteridales, an extinct group closer to the seed plants. After a general introduction, I will present two multidisciplinary projects conducted at AMAP that combine (i) morpho-anatomical data from exceptionally well-preserved fossils, (ii) understanding of extant plant biology, and (iii) modeling, to investigate the biology of these early trees:

[1] a reconstruction of the architecture, growth, and carbon content of *Pseudosporochnus*, (Pseudosporochnales) using AMAPSim. An estimate of the carbon content of a forest of *Pseudosporochnus* was also calculated and compared to various extant forest types.

[2] a reconstruction of the hydraulic properties of the wood of *Archaeopteris* (Archaeopteridales) using electrical models: a previous model at the scale of one conducting cell (tracheid) and a more biologically accurate new model developed at the tissue scale (connected tracheids and rays).

Références:

[1] Dambreville A, Meyer-Berthaud B, Barczy J-F, Decombeix A-L, Griffon S & Rey H. 2018. Using architecture modeling of the Devonian tree *Pseudosporochnus* to compute its biomass. In *Transformative Paleobotany: Papers to Commemorate the Life and Legacy of Thomas N. Taylor*. M. Krings, C. Harper, N. Cuneo & G. Rothwell (eds), pp. 35-47

[2] Tanrattana M, Barczy J-F, Decombeix A-L, Meyer-Berthaud B & Wilson JP. 2019. A new approach for modelling water transport in fossil plants. *IAWA Journal* 40: 466– 487

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