

Comparing modern to historic *Equisetum* biochemistry and the role of CO₂ acclimation

Department: Physical Geography/ Sustainable development

Research group: Paleo-ecology/ Environmental Sciences

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Project description

Since the start of the industrial revolution, atmospheric CO₂ levels have risen from c. 280 ppm to 420 ppm and are still rising tremendously (Lan, Tans, & Thoning, 2023). The effect of these changing CO₂ levels has been measured in several plant species (Bonal et al., 2011; Pedicino, Leavitt, Betancourt, & Van de Water, 2002). These studies often only include angiosperms or gymnosperms, while ancient plant lineages are not studied frequently, and thus knowledge regarding effects of CO₂ on these plant groups is lacking (Rensing, 2017). One of these ancient plant lineages are the *Equisetum* (horsetails), of which the oldest remains of modern species are from the early Jurassic (Elgorriaga, Escapa, Rothwell, Tomescu, & Rubén Cúneo, 2018). *Equisetum* first evolved under high atmospheric CO₂ levels, and might still carry (genetic) adaptations that made them thrive in this past environment. Therefore, we would like to investigate how the post-industrial rise influenced, and future rise in CO₂ levels will influence, stomatal anatomy, leaf nitrogen, photosynthetic capacity, and silica content of several *Equisetum* species.

For this study, we want to compare traits between modern, herbarium and fossil samples and will conduct growth experiments under elevated CO₂. Samples will be analyzed for: i) stable carbon isotope ratio, ii) nitrogen content, iii) cuticle morphology, iv) silica content, and v) gas-exchange rates. In this assistantship, the student will help conduct the growth experiments and will execute several of the analyses.

Job requirements

This project requires some basic lab experience and basic knowledge on plant ecology. If the student already knows one of the specific analysis methods that we will use, that is a pre but prior knowledge on the methods is not necessary. We also prefer a student with basic skills in R.