During the Miocene epoch two huge, long-lived ecosystems shaped Central Europe (Lake Pannon; age: ~12 to 6 Ma) and western Amazonia (“Lake” Pebas; age: ~17 to 9 Ma). Within both a restricted number of ostracod lineages (mm-sized, bivalved crustaceans) diversified rapidly. In particular, the “brackish water” genus *Cyprideis* experienced a remarkable radiation, giving rise to dozens of new, endemic species. As calcified ostracod shells are easily preserved in the fossil record, morphology-based investigations offered the opportunity to trace evolutionary processes in detail – millions of years ago. Potential environmental triggers cannot be directly measured, however, can be deduced by a combination of sedimentological and geophysical/chemical methods.

We studied two clay pits (Mataschen/Styria, age: ~11.3 Ma; Hennersdorf/Lower Austria, age: ~10.4 Ma), which expose several tens of metres of limnic sediments of Lake Pannon (~ tens of thousands of years). Environmental changes (water depth, salinity, oxygenation, terrigenous influx), related to climate-driven lake level fluctuations, could be thoroughly delineated. The high-resolution sampling (5 mm sample intervals) of a 2.3 m thick section part (Mataschen) permitted the reconstruction of such changes and their effects on life down to a time-resolution of only a few years. A quantitative morphological analysis of *Cyprideis* valves revealed the gradual evolution of a new species, possibly linked to physiological adaptations to increased salinity caused by a rise in lake level.

In western Amazonia, we investigated natural exposures along rivers (e.g., Eirunepé/Brazil) and exploration cores (Brazil, state of Amazonia). Based on sedimentological indications, “Lake” Pebas was not to one vast, long-lived lake but corresponds to a mosaic of short-lived, shallow ponds/lakes, swamps and suspension-rich river systems (at least proven for the Eirunepé sections, age: ~9 Ma). The found ostracod associations and geochemical results (stable isotopes: δ¹⁸O, δ¹³C) demonstrated that *Cyprideis* has been fully adapted to freshwater conditions. Hence, the occurrence of *Cyprideis* in the Miocene of western Amazonia is no definitive evidence for the influence of marine waters and a straightforward application of uniformitarian principles is not feasible. The investigation of a 400 m long sediment core (age: ~13–11.5 Ma) permitted the taxonomic revision of about 2/3 of hitherto described *Cyprideis* species of western Amazonia. Our results emphasised again *Cyprideis'* capability to produce species flocks. Regularly it holds more than 90 % in the ostracod assemblages, with up to 12 co-occurring (sympatric) species within one palaeontological sample and fossil population, respectively. We assume that a locally unstable but on a regional scale long-lived wetland (“Pebas mega-wetland”) as well as specific pre-adaptations of *Cyprideis* (wide ecological tolerance, sexual reproduction, brood care) have facilitated its successful dispersal and triggered its diversification in western Amazonia.