

Wetlands are key ecosystems for the environment. Apart of providing unique habitats for a wide variety of flora and fauna, are important in water retention, carbon sequestration and climate stabilization on a global scale. They act as a geochemical barriers which effectively retain and immobilize heavy metals dispersed globally due to the human-induced activities. Unlike organic contaminants, which are degradable to harmless chemical species over time, inorganic pollutants cannot be destroyed. However, they can be transformed into less toxic forms by modifying their chemical and physical characteristics. By storing large amounts of pollutants for decades, the wetlands constitute a danger of changing from net sinks to net sources of the toxic elements. As they develop in an uncontrolled way, the release of the metals to water is possible in unfavorable conditions of a prolonged drought, lowering of ground water level due to mine activities or a change of land use. Especially, that climate-change predictions indicate considerable changes in water balance throughout Europe in future.

The project aimed at revealing the micro-scale mechanisms of biogenic sulfides precipitation and to determine their role in biochemical cycling of potentially toxic elements (PTE) in wetlands. As wetlands and the (micro)biological processes occurring in them are very dynamic at the annual scale, we aim at elucidating the influence of seasonal variability of wetland conditions on the metal sulfide stability and the rate of their precipitation. We plan to conduct detailed, interdisciplinary studies of wetlands, containing extremely high concentrations of toxic metals. The wetland pore water will be studied on an annual scale and the biogeochemistry and mineralogy of the wetland soil will be assessed on different spatial scales.

The obtained results will be valuable for environmental and health impact assessment of projects which change the integrity of polluted wetlands and will be important in predicting the long-time behavior of trace elements in waterlogged ecosystems. While providing insight into the conditions necessary to promote the immobilization of toxic metals in wetlands, the results of the project will be useful in engineered systems constructed for the treatment of industrial wastewater (e.g., acid mine drainage).