„The present is the key to the past" – this sentence is one of the cornerstones of Earth Sciences known as uniformitarianism. It was coined by English scientist William Whewell and popularised by famous geologist Charles Lyell. The idea behind is that present processes operated also in the past. Using this principle geologists can reconstruct past marine and terrestrial environments using modern analogues. Each environment (e.g. deserts, rivers, lakes etc.) has its own set of features which can be used for their identification in sedimentary sequence. A special kind of environment is represented by soils, which form where lithosphere, atmosphere, hydrosphere and biosphere act together – and those can also be found in sedimentary record, known as palaeosols. These are becoming a popular target in geological studies (sedimentological, mineralogical and geochemical) as they have the potential to record palaeoclimatic, palaeohydrological, and palaeobiological conditions.

Despite years of detailed studies of Permian and Triassic strata from European German Basin, the palaeosols and palaeoweathering horizons have not been analysed in detail. Studies of similar horizons from other sedimentary basins allowed to create various (often contradictory) hypotheses about Late Palaeozoic/Early Mesozoic climates. This Palaeozoic/Mesozoic transition is particularly important as it marks one of the biggest biota crises in Earth's history. The cause remains enigmatic and is linked to volcanic activity, spreading of oceanic anoxia or bolide impact (or combination of those). This boundary marks a mass extinction event when over 90% of all marine animals and 75% terrestrial fauna and flora became extinct.

This project is going to employ an integrated set of the research methodologies (including sedimentological, geochemical, mineralogical) for characterisation of alluvial and palaeosol horizons from Holy Cross Mountains and Bavaria. Sedimentological analysis will allow to reconstruct palaeoenvironmental conditions of soil formation. Selected rock samples will be analysed under optical and scanning electron microscopy and X-ray diffractometry to recognise mineral constituents and their alterations. Geochemical analysis (including inorganic, organic and stable isotope geochemistry) will be used for in qualitative and quantitative description of pedogenic and weathering processes during Permian-Triassic transition. Geochemical data will also be fundamental for constructing the sets of climofunctions such as palaeoprecipitation and palaeotemperatures for studied areas. Due to the high sensitivity of soils to the atmospheric composition they may be used to test hypotheses about the Late Permian/Early Triassic atmospheric chemistry.

Chemical and mineralogical data can additionally be used for chemozonation which can be utilized for local and regional correlations of these generally biostratigraphically barren formations.

This project would involve international collaboration with Nuremberg University. All data and results will be published under open-access policy and available *via* designated website.

In the light of dramatic climatic changes, we are witnessing nowadays, understanding of palaeoclimatic conditions and their changes may be crucial to better understanding of their consequences. Perhaps we could ask whether "The past is the key for the future"?