The climate of our planet is constantly evolving. Understanding the dynamics of these changes is important not only for reconstruction of the climatic conditions of past epochs but also for better prediction of climatic changed in near future. The latter becomes increasingly important due to the dramatic acceleration of climate changes in recent years. In our project, we propose to use surface karst structures called solution pipes as paleoclimate proxies. Solution pipes are nearly vertical, paraboloidal or cylindrical forms, found in many karst areas around the world. They are formed as a result of dissolution of limestone rocks by water saturated with carbon dioxide (carbonic acid) as well as by humid acids produced in the soil by decaying organic matter.

The shapes, lengths and spatial distribution of the pipes are the functions of physical conditions in which they were formed. The two most important factors here are the flow rate of water and temperature. This means, however, that by analysis of the shapes of the pipes we can infer the climatic conditions prevailing during their formation. The establishment of such a relationship is the goal of the present project. This task requires close collaboration between the physicists (Polish team) and geomorphologists (Slovenian team). The physicists will use numerical models and laboratory-scale experiments to determine the link between the environmental conditions and morphological features of the pipes which form under such conditions. Geomorphologists, on the other hand will carry out the field studies of solution pipes, which will then be the basis for paleoclimate reconstruction. The conclusions of these studies will be verified by comparison with the results of other paleoclimate reconstruction techniques. A particularly important role in our research plan will be played by the laboratory experiments, the goal of which is the direct observation of formation and growth of solution pipes in the laboratory conditions. The experiments will allow us to test the theoretical models of solution pipe formation , they will also serve as benchmarks to validate numerical simulations.