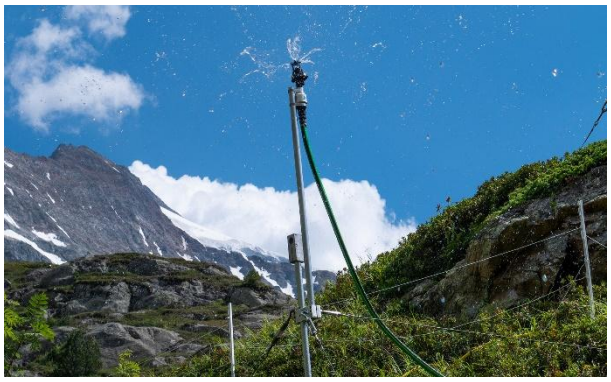
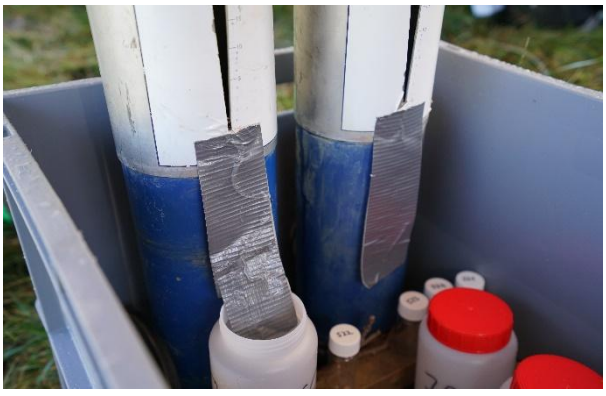
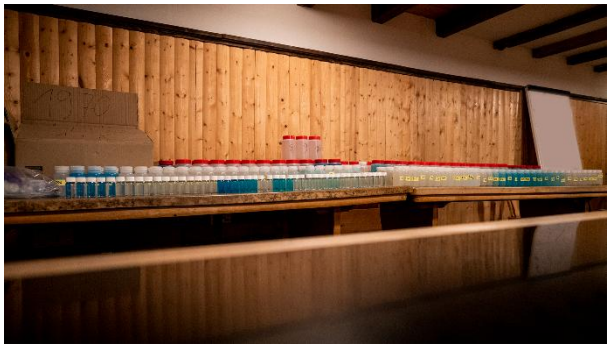
MSc thesis in Hydrology, starting summer 2019

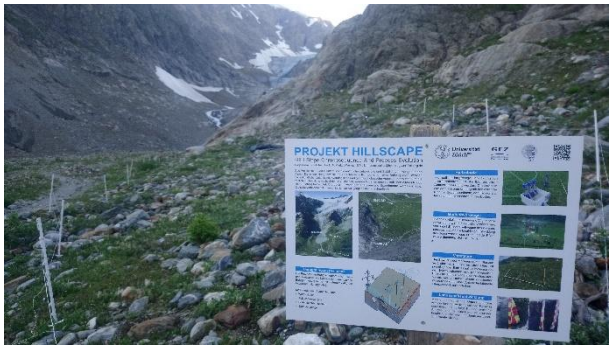
Water chemistry and event water dynamics for surface and shallow subsurface flow in a pro-glacial area

In order to understand runoff generation mechanisms in pro-glacial areas, it is important to understand how soil and vegetation development affect the dominant flow pathways on moraines. The long-term evolution of these near-surface flow pathways is however, to a large extend, still unknown. To close this knowledge gap, we will conduct artificial rainfall experiments on multiple test plots along a moraine chronosequence in the forefield of the Griessgletscher in the Swiss Alps. At each plot, we will use rainfall simulation with different intensities (20-, 30- and 60 mm/hour) to determine the amount of surface runoff and shallow subsurface flow. The irrigation water will be labeled (using deuterium and salt), which makes it possible to trace the rainfall in the surface runoff and its movement in and through the soil. Samples of surface and subsurface water will be collected at the bottom of the plots and will be analyzed for water chemistry (cations, anions, isotopes). This gives us an indication about the mixing of the rain water with the water that was already stored in the soil, the travel time of the water and the dominant runoff generation processes. Because we repeat these experiments for moraines with different ages, we can determine how the flow pathways change a function of moraine age and soil and vegetation development. The water chemistry data for the moraines also allows us to investigate the timescales of carbonate weathering.









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