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Hydrological and glaciological measurements of a basin with a retreating glacier (BigLink field site in central Switzerland)

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Hydrological processes on glacier forefields are temporal and spatially variable. The water sources shift over the season with snow melt in spring, followed by glacier melt in summer, both showing a distinct diurnal pattern. In autumn, the runoff is precipitation-driven and during the winter the water flows are very low. The heterogeneous soil and complex surface / subsurface topography result in highly variable patterns of the flow regime. To examine hydrological processes on local as well as on the watershed scale in such environments requires a hydrometeorological infrastructure that is ideally able to capture both the spatial and temporal variability of the hydrological regime. The objective of this presentation is a discussion about how main aspects of hydrological processes and the water balance in such an environment could be measured given significant constraints with respect to technical aspects and instrumentation costs. We therefore present the set-up of the hydrometeorological measuring infrastructure of the BigLink project on the Damma glacier forefield in central Switzerland (46°38.1´N, 8°27.6´E).

The study site has been equipped with meteorological, hydrological and glaciological measurements. An automatic weather station on the forefield captures the local meteorological conditions, and further stations in the vicinity capture the highly variable mountain meteorology in the region. These measurements are important for modelling of the snow cover and glacier development, the main influences on the hydrology. The discharge regime is monitored at several locations within the basin. These give useful insights of the watershed behaviour and also provide information about the hydrological processes of different sub-catchments. On a more local scale, groundwater tubes and soil moisture probes show how the surface and subsurface water bodies are connected. To assess the glacier mass and energy balance, ablation stakes, snow ablation patterns from photographs taken by an automatic camera and photogrammetric inventory of the glacier extent are available.