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A new approach to model alpine water balance processes and gradients

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Mountains are regarded as Ďwater towers of the world“, but in contrast to their relevance there is still a lack of knowledge concerning quantities and function of water balance components in alpine catchments. Existing meteorological networks recording parameters to estimate water balance components are sketchy, especially in areas above 2000 m altitude. This fact also holds true for the European Alps, certainly one of the best-investigated mountain systems worldwide. Hence, hydrological parameters such as precipitation and temperature are often assumed to be of linear character, but some studies reveal that the alpine topography does not allow to linear modelling along multiple-scaled gradients. Thus, the overall aim of our project was to improve the knowledge of hydrological processes and gradients by using a new multi-scale approach to model alpine water balance processes and gradients. We mounted 18 stations along an altitudinal gradient from 1300 m to 2700 m a.s.l. in the Lötschental, Switzerland. We measured precipitation and soil moisture, and used several empirical variables to calculate the potential evapotranspiration. Moreover, a high resolution DEM, soil and vegetation maps, and permanent terrestrial photography as well as standard remote sensing data served as the basis for spatial modelling using the water balance model WaSim-Eth. We used ablation gauges for glacier ablation measurements and used terrestrial images to record the variation of snow cover patterns. This approach allowed an estimation of the water storage capacity. Concept, methodology and preliminary results of a first field campaign will be presented and discussed. Concluding, we assess the new approach against former studies in mountain landscapes to show the importance of multiple gradient modelling of the alpine water balance.