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Case study Malalcahuello, Chile – a data scarce, anthropogenically undisturbed catchment in the Andes. Combining models and a multi-method experimental approach.

Obtaining hydrological process understanding of remote areas by relying solely on remote sensing data often proves to be impossible, especially as the spatial and temporal scales of these data sets are much larger than those of the dominating processes. In these situations it becomes necessary to go into the field to collect data by coming up with a monitoring design that maximizes our information gain while minimizing expenditures.

In case of the Malalcahuello Catchment, a small forested catchment situated on the southern slope of Volcan Lonquimay in the Chilean Andes, a mixed approach of experimental work and modeling seemed to be most promising.

Going into this study we were faced with many limitations: time, money, prior data and even accessibility of the site. Working in data scarce areas thus demands a combination of creativity with simple pragmatism, which here resulted in two choices: a) to focus experimental work on one typical hillslope assuming that understanding the processes here would help in understanding the hydrological functioning of the entire catchment and b) to use a multi-method approach, trying to amass data from a number of different measurements and experiments in order to piece together the hydrological puzzle within a relatively short time frame and with a relatively small budget.

As a counterpart to the experimental effort both a top down and a bottom up modeling approach was used. The top down approach used linear statistical models to predict catchment event response, i.e. event runoff coefficients, hoping that the parameters that proved to be significant for the prediction of the runoff coefficients would also tell us something about the functioning of the catchment. The bottom up approach used the physically based model CATFLOW to predict runoff generation (surface and subsurface) and was parameterized with the help of the newly acquired data.