**Spatial Validation of a Rainfall-Runoff-Phosphorus (RRP) model**

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In many regions, diffuse Phosphorus (P) losses from agriculture are the main cause for eutrophication of surface waters. Studies in different countries indicate that these losses originate from a small portion of a given catchment only. The localisation of such critical source areas (CSA) is a prerequisite for the evaluation of efficient and cost-effective mitigation options and catchment models are a valuable tool to identify them. However, models are often validated only at the catchment outlet. Furthermore, an increasing number of studies suggest that different runoff types (infiltration excess and saturation excess runoff) need to be distinguished when modelling phosphorus losses. Artificial rainfall experiments that we carried out in 2008 showed for example that SER has the potential to mobilise P more strongly than IER.

Here, we report on a comparison of field measurements with predictions of critical source areas obtained by means of the Rainfall-Runoff-Phosphorus (RRP) model of Lazzarotto (2005). The RRP model is a parsimonious semi-distributed model that was in particular designed to account for fast transport of dissolved P from intensively used grassland soils by surface runoff and preferential flow to tile-drains. The model was calibrated using runoff data from 4 different sub-catchments of Lake Sempach, Switzerland. At the catchment outlet, measured and modelled runoff and P concentrations matched well. The calibrated model was then used to assess the quality of the spatial predictions within a different catchment.

For this purpose, we performed soil moisture and runoff measurements within a sub-catchment of Lake Baldegg, which is located in the vicinity of Lake Sempach on the Swiss Plateau and, like the latter, is characterised by intensive agriculture. Four permanent measurement stations were set up at different locations in the catchment. Each station is equipped with 12 TDR probes, 2 temperature sensors, one runoff sensor and a piezometer. Soil moisture is measured at 10 and 30 cm depth. These stations provide continuous data which show whether the model is able to catch the temporal behaviour at these locations. Further data are obtained from piezometers, runoff sensors and mobile soil moisture measurements, as well as from P analysis of water samples collected at the catchment outlet and further upstream. Based on the topographical distribution of the measurement points, we expect that the setup will allow us to assess the relevance of infiltration excess and saturation excess runoff in P export from the catchment.

Lazzarotto, P., 2005. Modeling phosphorus runoff at the catchment scale. Diss ETH 15857, Swiss Federal Institute of Technology, Zürich. http://e-collection.ethbib.ethz.ch/ecol-pool/diss/fulltext/eth15857.pdf