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Sediment from agricultural catchments as a source of phosphorus loads

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Four institutes - CTU in Prague, Biology Centre AS CR, Water Research Institute, and Vltava River Basin Administration - have started a join project on the assessment of phosphorus loads causing eutrophication of stagnant water bodies. The aim of the project is balancing all types of phosphorus sources in catchments, estimating the eutrophication status of particular reservoirs, and then proposing compensation measures. Total assessed area will exceed 30 000 sq km so the proper methodology has to be tested first.

As a training and testing locality the Rimov Reservoir watershed was selected. Rimov Reservoir is located in Southern Bohemia; the area of its catchment is 488 sq km with ca 15 % located in Austria. The landscape is hilly with altitude varying between 450 and 1100 m asl. Traditionally the area has been agriculturally used (grazing), however, during the socialism period (1950–1990) the agriculture was intensive with high proportion of arable land and crop rotation not suitable for mountain conditions. During the last 20 years most fields were converted back to permanent grassland. The landscape evolution and its consequences were assessed by Van Rompaey et al. (2003).

Soil loss and sediment transport on agricultural land has been calculated using WATEM/SEDEM model (Van Oost et al., 2000; Van Rompaey et al., 2001). Water courses have been assumed as only connecting elements and no sediment accumulation has been expected here. Further extensive deposition has been applied at ponds and small water reservoirs. The formula by Dendy et al. (1978) has been adapted to the model correlating the trapped sediment with average annual discharges and reservoir volumes. There are more than one hundred of small reservoirs, but only 28 of them with existing data. Volumes of the others were computed based on a relationship between volume and water surface area. The volumes and areas of known reservoirs correlated sufficiently. Discharges for profiles of individual reservoirs were interpolated using gauging station data and specific runoff within the catchment (presented by David&Krasa at EGU 2011).

WATEM/SEDEM input parameters were set according to calibration in previous studies. Validation then has been provided using data from 15 profiles sampled monthly for 10 years for suspendend solids and particulate phosphorus. The problems were mainly with connecting the Austrian and Czech databases, since the best resolution data were available only for the Czech side; the parcel fragmentation for Austria had to be estimated. Based on the model validation, the results fit for profiles with catchments larger than 15 sq km, which corresponds well with the general assumption of suitability of empirical models application for large areas.

The assessment is supplemented by data testing and nutrient balance models to reach the further project goals.
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