Geophysical Research Abstracts
Vol. 13, EGU2011-3417, 2011
EGU General Assembly 2011

Discharge regime assessment for purposes of reservoir sediment trap efficiency estimation

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Research project called „Assessment of soil erosion and phosphorus loads causing eutrophication of stagnant water bodies “has been solved by consortium of four institutions since 2010. This project spreads over broad range of processes connected to phosphorus flux and eutrophication processes in water reservoirs. CTU Prague controls the project team. One of particular problems solved within the project there is the calculation of sediment trap in reservoirs within catchments of endangered reservoirs.
Proportion of sediment trapped in reservoirs is expressed by Trap Efficiency (TE). Brune (1944) introduced the methodology based on statistic evaluation of data from high number of reservoirs. Trap efficiency is expressed graphically and as an input Capacity inflow ratio is considered. This variable is a ratio between reservoir storage volume and mean annual discharge. Dendy (1978) added more reservoirs and developed analytical expression of the method.
The problem with calculation of sediment trap in reservoirs over large catchments is a lack of input data. Both storage volume of reservoirs and mean annual discharge are usually available only for small portion of the total number of reservoirs in conditions of the Czech Republic. In this paper, the methodology on deriving mean annual discharge in small streams is presented. Using the map of specific runoff values is the typical way of determining runoffs in upper catchments. Unfortunately, detailed map is not available in the Czech Republic. Possibilities for deriving the map from existing data were tested (Mean annual discharge values for selected profiles are the only accessible data). The proposed methodologies were tested within a case study of the Římov water reservoir basin (500 km sq) located in South Bohemia.
Two different approaches were tested for purpose of specific runoff deriving. Both can then be used for calculation of mean annual discharges in the reservoirs'profiles within the catchment. The former approach consisted in balanced computation of specific runoff values while the latter approach consisted in non-balanced method. In principle, both approaches are different in calculation of specific runoff in intercatchments. Mean annual discharge in upper profiles is considered when calculating specific runoff in intercatchments using the balanced method. In the non-balanced method it is omitted.
Specific runoff maps were derived using both approaches and results were compared in two ways. At first, specific runoff values were compared with respect to published values in the Czech Republic. At second, mean annual discharges in known profiles were calculated using non-balanced approach and compared to original values. It is obvious from obtained results that second approach gives more realistic results of specific runoff in intercatchments than balanced method and the differences between original discharges and discharges calculated using non-balanced approach are less than 10 % which can be considered acceptable.
The research was supported by the NAAR project „Assessment of soil erosion and phosphorus loads causing eutrophication of stagnant water bodies “. The support is highly acknowledged.
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