Geophysical Research Abstracts
Vol. 20, EGU2018-12026, 2018
EGU General Assembly 2018


# Numerical Analysis of Sediment Transport Processes during Flushing Processes of an Alpine Reservoir

Gabriele Harb
VERBUND Hydropower, I, Semriach, Austria (gabriele.harb@gmx.at)

Sedimentation processes are in a “dynamic balance” in most natural rivers, but the construction of dams and reservoirs influences these natural conditions. The flow velocities, turbulences and bed shear stresses in reservoirs are reduced compared to free flow conditions, which lead to the deposition of the transported sediment particles. As a further consequence the sediment depositions reduce the storage volume by “filling up” the reservoir. This “reservoir sedimentation” is a problem in many Alpine reservoirs.
In the case of Alpine reservoirs with a small storage volume compared to the annual inflow, such as reservoirs of run-off river power plants, the water depth are usually lower than in reservoirs of storage and pump-storage hydro power plants. A larger part of the suspended sediments is thus transported through the reservoir and deposition of bed load fractions is the main problem. The deposition of coarse sediments at the head of the reservoir may cause problems regarding flood protection by raising the bed level and thus, raising the water level too.

This study focus on the sediment transport processes during a flushing event in an Alpine reservoir. The reservoir was built in 1981 and is approximately 4.5 km long with an initial storage volume of about 1.4 Mio. m3. During former flushing events a small amount of the deposited sediments has been eroded and transported through the reservoir. However, echo-soundings performed in 2007 showed that approximately 890,000 m3 of sediments are already deposited in the reservoir. This represents an annual sedimentation rate of about 6.1% of the initial reservoir volume or an annually sediment deposition of about 85,000 m3.
An open source three-dimensional numerical model with an internal coupled hydrodynamic and morphological part was used to simulate the flushing process. The calibration of the hydrodynamic model was done using ACDP measurements performed at the prototype to calibrate the roughness at the river bed and at the banks. Echo-soundings performed before and after the flushing event were used to evaluate the morphological changes calculated by the numerical model. Additionally an extensive sensitivity analysis was carried out and several sediment transport formulae were tested. It was found that the simulations using the bed load equation derived by Van Rijn showed the best agreement with the measured data.