8th International Conference on Fluvial Sedimentology
August 7-12, 2005; Delft, The Netherlands

Sediment transport processes during a flushing event of a run-off river plant in Austria

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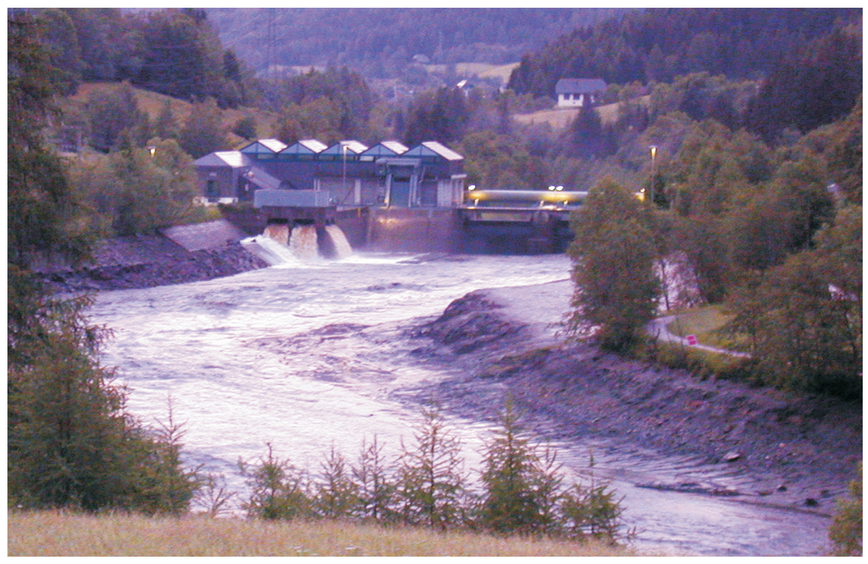
1. Introduction and Objectives

The run-off river power plant Bodendorf is the head storage of a series of power stations at the river Mur. Since 1994, free flow flushings are undertaken at different boundary conditions. Objectives of the monitoring of the flushing in the year 2004 are:

- To establish a sediment balance of the flushing event 2004.
- To evaluate the effects of groins and initial channel on bed load transport.
- To calibrate a 2D numerical model to vary the boundary conditions and their effects on sediment transport during flushings.
- To work out the best flushing strategy in an ecological and economical way for the run-off river power plant Bodendorf, based on the collected data.



Power plant Bodendorf during the flushing

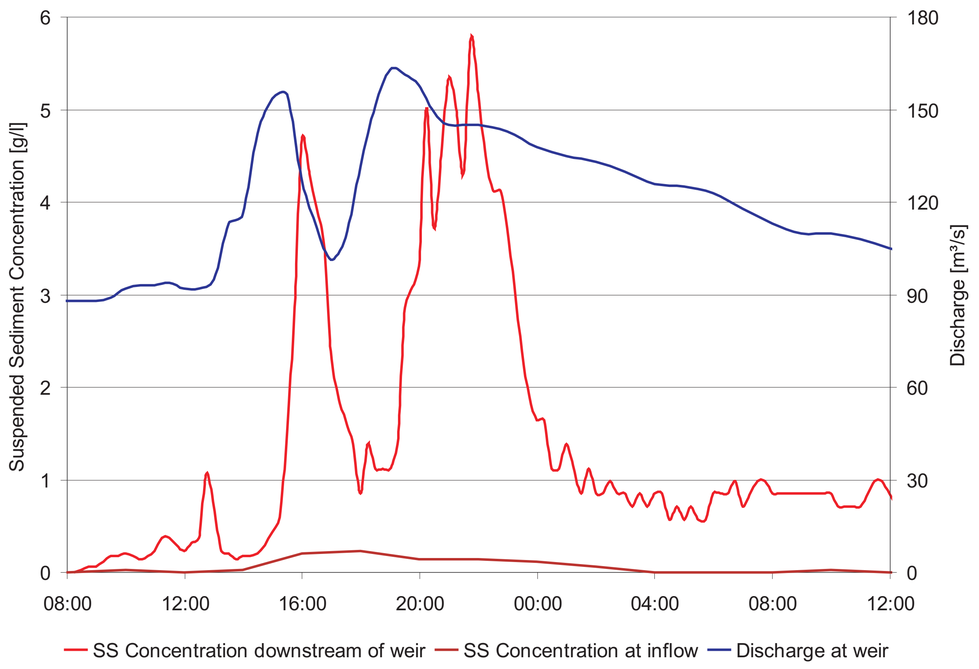


Fig. 1: Suspended sediment concentrations and discharge during the flushing

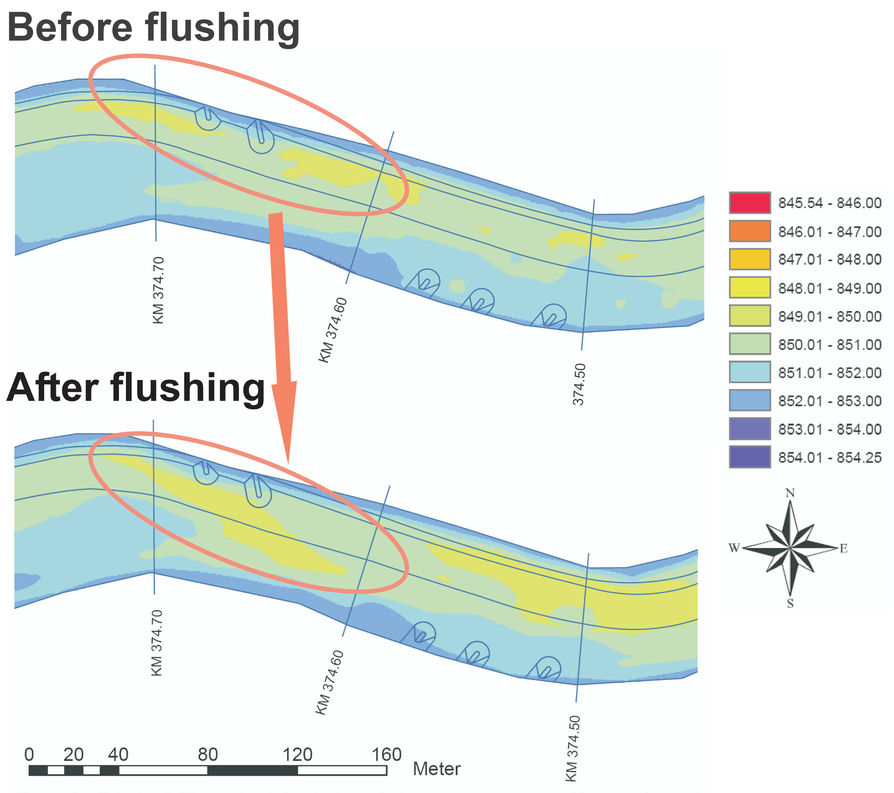


Fig. 2: Digital Terrain Models of the reservoir, effect of groins

2. Methods

Different measurement methods were used to determine bed load, suspended load, and hydraulic data during the flushing event:

- Echosounding of the reservoir before and after flushing.
- Helley Smith bed load sampling at the inflow.
- Suspended sediment sampling at 3 different points of the reservoir.
- Gauging stations for water and discharge monitoring.
- Grain size analyses.

3. Results

Figure 1 shows the suspended sediment concentration at the reservoir´s inflow, the suspended sediment concentration, and discharge downstream the weir during the drawdown of the flushing. The discharge had to be reduced after exceeding the value of 4.5 g/l to prevent ecological damages downstream. This direct intervention also has a negative effect on bed load transport. The free flow through the weir gates was achieved after 7.5 hours.

The bed load sampling at the beginning of the reservoir shows a small amount of sediment input during the flushing. The calculated ratio between total sediment input and total sediment output is 1:8.1.

Digital Terrain Models (DTM) before and after flushing were the basis for establishing a mass balance. Moreover, they demonstrate the effect of groins (Figure 2).

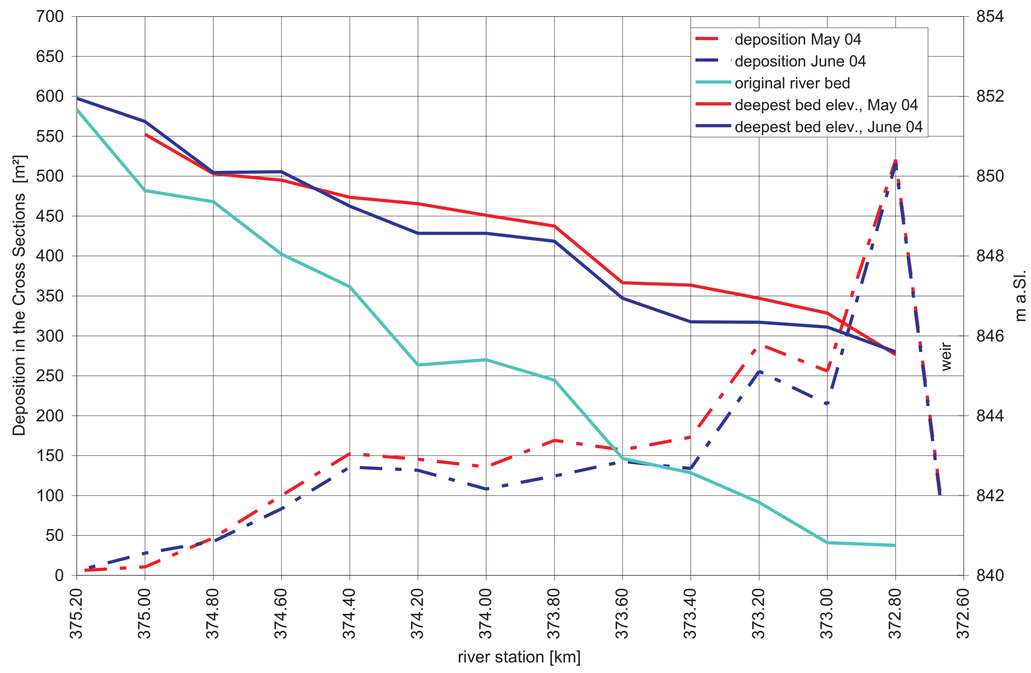


Fig. 3: Deepest bed elevation and sediment depositions in a longitudinal section

4. Discussion and Outlook

As a part of an applied research project the monitoring programme is the basis for further investigations concerning ecological and economical optimisation of a reservoir flushing in Austria.

DTMs and sediment measurements give information about sediment transport processes within the complex reservoir operation. The detailed mass balance proved to be a good tool for evaluation of the effectivness of the flushing.

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5. Acknowledgment

The Graz University of Technology, Institute of Hydraulic Engineering and Water Resources Management is partner of the EU Interreg IIIB Project ALPRESERV (www.alpreserv.org). We would like to thank the EU for co - financing the project and the partner Verbund - Austrian Hydro Power A.G. for the nice collaboration within the project.