

Editorial

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By the end of the nineteenth century the first hydraulic laboratories had been established, mostly in the current technical universities. Physical modelling allows insight into the complex interactions between water flow and hydraulic structures. Hydraulic physical modelling became an effective support tool in solving complex hydraulic problems. Results from model tests acted as a driving force for further theoretical developments of analytical and later also numerical methods. Today the development of mathematical models and numerical simulations, as a cheaper and faster approach, decreases the significance of hydraulic laboratory tests but cannot fully substitute for physical modelling. Physical modelling is still used in solving very complex problems and in the verification of new developed mathematical and numerical models. Mathematical models often need input parameters that can only be determined through physical modelling. Therefore, both physical modelling in hydraulic laboratories and mathematical and numerical models are complement and irreplaceable in practical design and research work in hydraulic engineering today. This issue of *Water Management* illustrates the implementation of experimental and numerical methods and their combinations in solving typical hydraulic problems.

Two papers in this issue discuss local scour around bridge piers, including interference of water flow, structure and river bed sediments. Local scour is often a reason for bridge collapse and is therefore also a topic with great public interest. The problem of scouring is a complex topic dependent on a large number of parameters. These different parameters are discussed in the first two papers.

The paper by Chreties *et al.* (2013) presents the influence of flow conditions on local scour around pier groups. The authors chose physical modelling and concentrate their research on equilibrium scour depth with ‘no memory’ effect – scour depth does not depend on the flow conditions used to obtain the actual scour state. The results confirm that sediment characteristics are the most dominant factor defining form and depth of the scour hole. The experimental results also demonstrate that the ‘no memory’ hypothesis is valid for pier groups where the pier cap does not interfere with the flow.

The second scour paper (Dehghani *et al.*, 2013) is a detailed study of scouring around bridge piers under unsteady flow conditions. The authors chose to use a three-dimensional numerical model, combining Navier–Stokes equations and the sediment continuity equation. In the study, stepwise defined hydrographs with different peak discharges and period shapes were used, simulating time-

dependent scour development around a circular pier. The suggested numerical procedure provides good agreement with scour depth measured in the experiment and could be applied to assess scour development in real flood, unsteady state, conditions.

The paper by Wallerstein and Arthur (2013) deals with the estimation of trash screen blockage by organic and manmade debris. More than 100 trash screens in Northern Ireland were inspected and analysed for over 6 years. Using the multiple regression method the blockage of trash screens was correlated with driving variables, such as: characteristics of debris, land use and social deprivation of catchment, channel properties and trash screen characteristics. The authors developed simple empirical equations with parameters defined from observed cases. The equation parameters are identified as variable coefficients distinguishing between monthly, seasonal and annual sets. The method helps local authorities in maintenance of the screens, defining periods of the year when clogging extent and blockage risk is maximal and optimising the screen clearance regime. The authors attempt to extend the method to other locations, but with limited success. Additional research, especially in definition of parameters, defined by regression, is required.

In the next paper, Donjadee and Chinnarasri (2013) perform field experiments implementing vetiver grass mulch as surface soil erosion protection. The effect of grass mulch on water and soil conservation was tested on an experimental field. Normally cut grass is used as a raw compost material, but in this study grass cuttings were applied to the plots and left to naturally decompose over four months. During the decomposition the mulch increased soil moisture-holding capacity and improved soil fertility. Vetiver grass mulch, in the large quantities produced during pruning, was successfully used for conserving soil and stabilising slopes. The field experiment was performed on a prepared field with an installed rainfall simulator and soil setup characteristic for the region. The rainfall simulator imitates rain in intensity, drop size and impact kinetic energy. The runoff rate and erosion rate for different rainfall intensities and different mulch quantities were tested. Vetiver grass mulch reduces the impact of raindrops on the soil surface and enhances water infiltration in the soil, thus reducing water runoff and soil loss. The best effects were achieved with a quantity of 0.75 kg/m² of grass mulch with soil erosion reduction over 70%. Mulching is shown to be an effective method for erosion reduction, especially by high intensity rainfall.

Chemical contamination of surface water is a significant environmental issue. The flow, transport and fate of chemicals are mostly

influenced by water flow. Sediment transport also plays an important role in pollutant transport. Mahdavi *et al.* (2013) investigate sorption of cadmium in sediment, transport of cadmium with sediment and desorption back into the water. An experimental setup with a circular flume simulating river flow was applied for modelling adsorption of cadmium in sediment. The experimental results with varied initial cadmium concentrations were used for determination of the numerical model of the sorption processes and definition of needed kinematic parameters. The second-order kinetic model showed better agreement with the experimental results and is suggested by the authors for further modelling.

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