Editorial

Alessandra Crosato MSc, PhD

Senior Lecturer and Researcher, UNESCO-IHE and Delft University of Technology, the Netherlands

This issue of *Water Management* presents scientific findings that increase the understanding of water flows and contribute directly or indirectly to the management of water resources. The first two papers deal with aquifer pollution and sub-surface water flows while the final two papers look at water flows in regulated rivers. The issue closes with a discussion on the effects of bedforms on river channel roughness and on the relative consequences for the prediction of water levels.

Numerical modelling has become the dominant tool for scientific investigations in water-related issues. In line with this, the works provide improvement and validation of existing numerical models or advice for good modelling practice.

The first paper (Ahmed and Chen, 2012) analyses the effects of tide-induced water table fluctuations on contaminant sorption in beach aquifers. Near-shore groundwater pollution occurs because of the development of coastal areas, where sources of contaminants include solid wastes and the use of fertilisers and pesticides for agriculture. Once spilled on land, the contaminants move gradually seaward, transported by the sub-surface flow, negatively affecting the quality of coastal waters. The paper focuses on the fate processes of naphthalene, a contaminant that binds itself to solid particles. To reproduce these processes, the authors combined a numerical model for water flow with a model for the transport of pollutants. They investigated both equilibrium and rate-limited sorption in coarse sand under fluctuating and constant water table conditions. The results show that the tidal effect depends on the distance between spill location and shoreline, as well as on the partition coefficient and the rate of mass transfer.

The second paper (Lei *et al.*, 2012) deals with non-uniform groundwater flows, focusing on the effects of preferential channels on flow dynamics. These channels are formed by soil macropores and fractures, such as worm holes and root paths, enlarged by the flowing water. The authors performed a number of field experiments irrigating a silty-clayey soil with water containing an iodide tracer. Clear preferential flow channels formed in the soil as a response to the large amounts of irrigation water. Numerical simulations of the experiments were undertaken to verify the performance of a hydrogeosphere model simulating soil water content and the dynamic process of infiltration under non-uniform conditions. The comparison with a model based on a continuous medium shows the importance of incorporating soil fractures for the modelling of sub-surface water flows.

The third paper (Xia *et al.*, 2012) deals with the modelling of unsteady flow in large lowland rivers. A two-dimensional hydrodynamic model incorporating a procedure for wetting and drying of grid cells is tested against field data of man-made floods in the braided reach of the lower Yellow River (China). The model is based on the finite-volume method on unstructured triangular grids. The results show that wetting and drying of grid cells can improve the simulation of low flows through channels with complex bed topography, like braided rivers. For the representation of channel roughness, the authors provide a figure showing the channel roughness against the flow Froude number as it was derived from field data. The Manning coefficient appears three to four times larger at low flows than at high flows. This highlights the importance of including the variations of the roughness coefficient as a function of flow intensity in hydrodynamic models and provides extra material for the discussion that closes this issue of *Water Management*.

The fourth paper (Chiquito, 2012) deals with the planning of reservoir size and operations to assure full exploitation of the catchment waters that are drained by the river. The paper focuses on the methods to optimise regulated river flows introducing some changes to the widely used residual mass and regulation curve methods by adding a third variable, the time of emptying and filling of the reservoir. The proposed method is a rapid way of comparing the potential of several rivers or sites along the same river and can be used for preliminary design of reservoirs.

The issue ends with a discussion initiated by Charles Neill (McGahey *et al.*, 2012). The discussion highlights the importance of taking into account the variations of river channel roughness due to changes in flow discharge for the modelling of river water levels. The authors of the original paper (McGahey *et al.*, 2009) confirm that the Environment Agency's 'roughness advisor', implemented in the conveyance estimation system (CES), does not take these variations into account. The software was developed for uses in the UK, where river channels are typically small and only a few of them have bedforms that significantly change with the flow intensity. Instead, roughness variations due to changing bedforms are important for large sand-bed rivers. CES can be used on these rivers as an exploratory tool only, keeping in mind this limitation. Constant roughness values, derived from alluvial friction theories not implemented in the CES, may be imposed for different discharges.

REFERENCES

- Ahmed AA and Chen D (2012) Modelling of naphthalene sorption in shallow beach aquifers. *Proceedings of the Institution of Civil Engineers – Water Management* **165**(7): 355–364, <http://dx.doi.org/10.1680/wama.10.00081>.
- Chiquito L (2012) Optimum point in a river regulation curve. *Proceedings of the Institution of Civil Engineers – Water Management* **165**(7): 393–402, <http://dx.doi.org/10.1680/wama.10.00079>.
- Lei Z, Therrien R, Jinzhong Y and Qing Z (2012) Experimental and numerical simulation of water movement in soil. *Proceedings of the Institution of Civil Engineers – Water Management* **165**(7): 365–376, <http://dx.doi.org/10.1680/wama.10.00056>.
- McGahey C, Knight D and Samuels P (2009) Advice, methods and tools for estimating channel roughness. *Proceedings of the Institution of Civil Engineers – Water Management* **162**(6): 353–362.
- McGahey C, Knight D, Samuels P and Neill CR (2012) Discussion: Advice, methods and tools for estimating channel roughness. *Proceedings of the Institution of Civil Engineers – Water Management* **165**(7): 403–404, <http://dx.doi.org/10.1680/wama.11.00041>.
- Xia J, Lin B, Falconer RA and Wang Y (2012) Modelling of man-made flood routing in the lower Yellow River, China. *Proceedings of the Institution of Civil Engineers – Water Management* **165**(7): 377–391, <http://dx.doi.org/10.1680/wama.11.00028>.