



Modelling Surface water-groundwater interaction in New Zealand: Model development and application

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Most rivers worldwide have a strong interaction with groundwater when they leave the mountains and flow over alluvial plains before flowing into the seas or disappearing in the deserts. In New Zealand, typically rivers lose water to the groundwater in the upper plains and generally gain water from the groundwater in the lower plains.

The New Zealand national hydrological model (TopNet), based on TopModel concepts, has been developed during the past 12 years for flood prediction and water resources assessment at National and regional scales. Its previous applications across New Zealand outlined that the current conceptualisation is failing to model the river and groundwater interaction due to its over-simplified groundwater process.

In this study, a more realistic conceptualisation of surface water groundwater interaction is implemented in the national hydrologic model. This is done by adding an additional groundwater store to the current conceptualisation to simulate groundwater flow and interaction with rivers (i.e. losing and gaining) and to provide the ability to incorporate local information (e.g. flow and groundwater).

The updated conceptualisation has been applied to a watershed in the Canterbury region of South Island of New Zealand where a strong interaction between the river and groundwater has been documented and a large number of flow measurement sites and information along the river main stream is available. Results show the simulations fit quite well to flow measurement and explains the river dynamics quite well. This indicates that the updated model might be used at national scale to improve the simulation of hydrological processes in flat areas where groundwater processes are important.