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Modelling the effects of acid deposition: refinements, adjustments and inclusion of nitrogen dynamics in the MAGIC model

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Abstract. The MAGIC model of the responses of catchments to acidic deposition has been applied and tested extensively over a 15 year period at many sites and in many regions around the world. Overall, the model has proven to be robust, reliable and useful in a variety of scientific and managerial activities. Over the years, several refinements and additions to MAGIC have been proposed and/or implemented for particular applications. These adjustments to the model structure have all been included in a new version of the model (MAGIC7). The log aluminium – pH relationship now does not have to be fixed to aluminium trihydroxide solubility. Buffering by organic acids using a triprotic analog is now included. Dynamics of nitrogen retention and loss in catchments can now be linked to soil nitrogen and carbon pools. Simulation of short-term episodic response by mixing fractions of different water types is also possible. This paper presents a review of the conceptual structure of MAGIC7 relating to long-term simulation of acidification and recovery, describes the conceptual basis of the new nitrogen dynamics and provides a comprehensive update of the equations, variables, parameters and inputs for the model.

Keywords: process-based model, acid deposition, recovery

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