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MATHEMATICAL MODELS TO SUPPORT POLLUTION COUNTERACTION IN CASE OF ACCIDENTS

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Abstract

This paper presents a mathematical model for the prediction of pollutant transport in rivers. The model has been developed and calibrated using the Matlab software and relying on field data from Romanian Someş River (collected in case of accidental cyanide release). Field data has been used to estimate model parameters (e.g. dispersion coefficient, velocity) as variable in time and space in order account for river features non-uniformity in time and also in space. These initial parameter values have been employed for the calculation of pollutant distribution along the river based on explicit analytical solutions of the advection-dispersion fundamental equation for mass transport in rivers (Fickian approach). Further, parameters optimization has been carried out during model calibration involving a custom tailored optimization algorithm. Results of the comparison between simulated and experimental data show that calibrated model is capable to predict satisfactory the dynamic distribution of pollutant concentration along the river stretch. Peaks travel times are the best predicted features compared to trails, revealing accurate velocity estimation along the stretch. Consequently the model can be employed in case of accidental pollutant releases and also in case of pollutant releases under customary conditions (for cyanides and other pollutants), in order to offer decision support in river water quality management.

Key words: pollutant transport model, accidental river pollution, Someş River cyanide, water quality

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