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Modelling water regime of a metal contaminated soil at the plot-scale: the role of vegetation

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Plant development can be affected under heavy metal stress, resulting in different patterns of root distribution, and possibly in a modification of the soil structure (through the creation of more or less developed root-macropores). This, in return affects the water uptake by plants, as well as the water transfer through the root zone, and influences the whole water regime. The aim of this study was to investigate in which degree heavy metal contamination in soils would affect hydrological processes, with an emphasis on the role of vegetation. Water regime changes in a heavy metal contaminated soil, under a young forest ecosystem grown in lysimeters, were monitored (see Menon et al., this session), and then simulated using first HYDRUS1D (Simunek et al., 1998). The inverse modelling package SUFI (Abbaspour et al., 2005) was coupled to HYDRUS, in order to calibrate the parameters of the van Genuchten retention curve, against hourly tensiometer data and TDR data obtained during the summer 2003. Control data (without heavy metal pollution) were used for the calibration. HYDRUS1D together with the calibrated parameters was then applied to the data corresponding to the contaminated soil. Good agreement was obtained between the observed and simulated water potentials, but only for the upper part of the lysimeter. On the other hand, the model overestimated the water content of the bottom layers of the soil, possibly because it did not take into account the deeper penetration of the roots in the contaminated soil. Another modelling attempt was then made, using the MACRO model (Larsbo et al., 2005), where the plant growth module allows more flexibility than in HYDRUS. The following modelling strategy was adopted: the parameters of the van Genuchten function calibrated using HYDRUS against the control data were used, and macropre flow parameters and plant growth parameters were calibrated using MACRO together with

SUFI. This was done for both the control lysimeter and the contaminated soil, in order to show the effects of soil contamination on root and macropore development, and thus on the water regime.

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