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A Model of Accumulation of Radionuclides in the Soil-Plant System originating from Groundwater Contamination

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We present a model to describe the transport and accumulation in the soil-plant-system of a radionuclide originating from a groundwater contamination. The model is designed as a general trace element model and written in Matlab-Simulink. Two model approaches describing the plant uptake of a radionuclide were included, namely passive and active uptake. Furthermore, a simple approach describing adsorption to soil particles and organic matter is included. The radioactive element is represented as a state variable in different plant parts (stem, leaves, fine and coarse roots, grain) and in soil layers as part of soil organic matter fractions (litter, coarse litter and humus), solved in soil water solution and adsorbed to soil particles. The tracer element is added to the ecosystem by groundwater contamination and leaves the ecosystem by harvest and percolation or drainage. Most of the radionuclide fluxes are assumed to be in proportion with either the water or carbon fluxes, which can be simulated by two external models, the CoupModel (Jansson & Karlberg, 2004) and the Rue model (Noronha-Sannervik, 2003). Both models simulate the dynamically coupling of fluxes of water, heat, carbon and nitrogen in the soil-plant-atmosphere system. The radionuclide model is also linked to the sensitivity package EIKOS (Ekström & Broed, 2005) for Monte Carlo simulations, see our second presentation, Gärdenäs et al. 2007). The model has large potential to be used for other trace element/or compound originating from groundwater contamination.