

## Estimations of unsaturated zone flow and groundwater recharge using a coupled UZF1 and MOFLOW approach

*Samrit Luoma & J. Okkonen*

*Geological Survey of Finland*

Groundwater recharge is an important process in maintaining groundwater levels and the sustainability of groundwater resources. Future climate change (due to change in precipitation and temperature) would have impacts on hydrological systems, groundwater recharge and groundwater resources. Groundwater flow model that is used as a tool to assess the impact of climate change on groundwater resources requires a continuous infiltration flows from the ground surface down to the groundwater table. The previous version of MODFLOW applied the net recharge rate into the groundwater table for the groundwater flow simulation. This causes an unrealistic estimation of groundwater recharge, especially under climate change scenarios. This study utilised a couple of 1D Unsaturated-Zone Flow (UZF1) model package with 3D groundwater flow model MODFLOW-2005 to simulate flow from the unsaturated zone through the aquifer, by using the surface water available for infiltration produced by the snow and potential evapotranspiration (PET) models. Then infiltration rate, flow in the unsaturated zone and groundwater recharge were simulated using the UZF1 package run in the MODFLOW-2005. The water balance components from the groundwater flow simulations consisted of infiltration rate in the unsaturated zone, evapotranspiration in the unsaturated zone and saturated zone, the recharge rate, surface leakage, and the change in water storage. The transient groundwater flow model provided information on groundwater recharge into the aquifer system, and also on surface water and groundwater interactions, such as groundwater discharge to low-lying areas. It thus provided a more realistic picture of the groundwater recharge process than previous studies. The simulation results from this study provide useful information not only for the groundwater resources management, but also for land users and land-use managers to support land-use and land-use planning and management in the study area.