Geophysical Research Abstracts
Vol. 17, EGU2015-15394, 2015
EGU General Assembly 2015

Infiltration and water balance modeling along a toposequence in a rubber tree plantation of NE Thailand

Claude Hammecker (1), Siwaporn Seltacho (2), Nopmanee Suvanang (3), Frederic Do (1), and Rafael Angulo-Jaramillo (4)

(1) UMR Eco&Sols, Institut de Recherche pour le Développement, Montpellier, France, (2) Land Development Department region 5, Khon Kaen, Thailand, (3) Land Development Department OSLD, Bangkok, Thailand , (4) University of Lyon, LEHNA UMR 5023 CNRS ENTPE UCBL, Vaulx-en-velin, France

Northeast of Thailand, is a plateau at 200 m AMSL with a typical undulating landscape. Traditionally the lowlands were dedicated to paddy fields and the uplands covered by Dipterocarpus forest. However development of cash crops during the last decades has led to intensive land clearing in the uplands and to modifications at a regional scale of the water balance in the critical zone with increasing runoff and soil erosion. Recent international demand increase for natural rubber motivated many local farmers to shift from these cash crops towards rubber-tree (Heva Brasiliensis) plantations. However these land use changes have been undertaken without considering the climatic and edaphic specificity of the region, which are not well adapted to the growth of rubber tree (rainfall lower than recommended and sandy soils with low fertility). Therefore, in order to assess and try to predict the environmental consequences (water resources, water-table, ..) of the development of rubber tree plantations in this area, a small watershed in the region ok Khon Kaen has been selected to follow the infiltration and to monitor the different components of the water balance along a toposequence. A six years monitoring of the main components of water balance along a toposequence associated to numerical simulation were used to quantify and try to forecast the evolution of the water use and water resources. Unsaturated soil properties were determined at different depths, in various positions along the toposequence. Experimental results supported by modeling of 2D water flow with HYDRUS3D show clearly that infiltration is blocked by a clayey layer on top of the bedrock and conditioned the occurrence of a perched watertable during the rainy seasons. Most of the soil water flow was found to be directed laterally during the rainy season. The deep groundwater was found to be fed from the lower part of toposequence in the thalweg. The transpiration rate measured on the trees at this stage of maturity was found to be still too low to affect the groundwater recharge. The results of prospective modeling performed to verify the sustainability of system considering the insufficient rainfall and the known water resources show that a decrease of the tree planting density should be considered.