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Hydrological analysis of remo climate scenarios developed for the Rhine river basin

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The Hydrology and Water Management group of Wageningen University is currently doing a research project for NeWater (New Approaches to Adaptive Water Management under Uncertainty). This research makes use of the catchment-scale distributed hydrological model VIC (Variable Infiltration Capacity), coupled with REMO Climate Scenarios, to evaluate effects on the hydrological regime of climate change in the River Rhine Basin. VIC is a land surface model (LSM), designed to simulate the interactions between land surface and atmosphere in climate models, but it has also been applied for hydrological purposes. Climate scenarios are based on data from the General Circulation Model ECHAM4 and downscaling was carried out at the Max Planck Institute fur Meteorologie, Hamburg, Germany (MPI) using the regional climate model REMO. The REMO Climate Scenarios cover the Rhine basin at a spatial resolution of 0.088 degrees and span the period of 2000-2100 at an hourly resolution. Three IPCC (Intergovernmental Panel on Climate Change) carbon emission scenarios were used to force the ECHAM4 model. These are, ranging from optimistic to pessimistic B1, A1B and A2, which are described in more detail at the website: http://www.grida.no/climate/ipcc/emission/. Before running VIC with the REMO Climate Scenarios, an analysis of these scenarios is carried out. When doing this, one can retrieve important characteristics of these scenarios, which may be helpful in running the VIC model. The seven parameters of REMO, necessary to run the VIC model, are precipitation, temperature, air pressure, vapour pressure, downward shortwave- and longwave radiation and wind speed. For each scenario, an analysis is done based on the variation of the temperature and precipitation over the years. A distinction is made

between summer and winter periods to see the seasonal variability over the years. Another interesting point of research is the analysis of extremes. Extreme dry and wet periods are of significant importance for the reliability of model results. For each scenario, the extreme dry and wet years are selected and based on this, return times are calculated. The characteristics of each sub-catchment are analyzed using the spatial distribution of these extremes over the catchment.