Assessing the long-term ecohydrology evolution of a meso-scale catchment in central Europe employing a combination of different monitoring techniques

Stephan Seeling (1) and Hugo Hellebrand (2)

(1) Trier University, Remote Sensing Department, Trier, Germany (seelings@uni-trier.de), (2) Trier University, Department of Hydrology, Trier, Germany

In contrast to many other European regions suffering under intensification of agricultural land use or increasing settlement areas more peripheral regions like the Saar-Nahe-highlands in the southwest of the federal state of Rhineland-Palatinate, Germany, are settings for a retrogression of land use patterns. The meso-scale catchment of Glan (1222km2), a western tributary to the Rhine, was during recent decades subject to a decline of area under crops, extensification in agriculture and an increasing of forested areas. Additionally and in particular in the state-owned forests a shift towards mixed and by broad-leafed trees dominated forests can be observed. This involves also higher mean ages of the forest stands. This alteration in percentage of forested area and forest composition is under suspect to have an appreciable impact on the water balance of the basin.

Two main analytic modules are the basis for our investigations, realized within the EC funded Interreg IVB project ForeStClim. The first is the exploration of land use changes within the catchment based on remote sensing techniques. To maximise the temporal cover of this investigation we employed imagery of the former American spy satellite system CORONA from the year 1962 and compared our classification results with land use classification deducted from recent image from the year 2007 taken by the multispectral ASTER satellite system. To validate and enhance results investigations had been supported by the employment of official statistics. Additional, to expand the observation period, the benefit of employment of historical maps and scenario techniques was under investigation. As a result, the rise of forested area by nearly 5% within the kernel investigation period (1962 – 2007) and a decline of percentage of pure coniferous forests had been ascertained.

To investigate also the proposed impact on the water balance of the basin, first a trend analysis was performed for discharge time series of the basin and three sub watersheds (period 1960 – 2001). This features moderate increasing trends for mean and peak discharge but turned out not to be significant. To assess also possible changes in the buffer and regulation function of the catchment an analysis of trends in duration and frequency of events of certain magnitude is under continuation. Without the results of this second trend analysis no significant impact of forest alteration on discharge dynamic was proved so far. This is mainly ascribed the spatial distribution of afforested and new settlement areas and to the slow evolution of forest-soils with accordant characteristics.