

EFFECTS OF ALTITUDE ON ECOHYDROLOGICAL PROCESSES

G. PESCHKE, C. SEIDLER AND U. FEISTEL

International Graduate School Zittau, Markt 23, D-02763 Zittau, Germany

If ecological investigations are included in the consideration of hydrological problems, then the term ecohydrology is used. Attempts have been made to investigate interrelationships between plant cover and abiotic environmental factors such as temperature, moisture, radiation, precipitation, and wind and soil conditions. These environmental factors also significantly control the water cycle processes. They depend on the regional and local climate and soil conditions. Local climates in mountainous regions are highly dependant on altitude. Consequently, the interrelationship between vegetation cover and hydrological processes in mountain areas is greatly influenced by altitude. Of the moisture and heat fluxes at the atmosphere, soil, and vegetation interfaces, two general processes predominate in their effect on the local hydrology, the interception decreasing the moisture input into the soil and transpiration increasing the moisture extraction from the soil. The resulting soil moisture and precipitation reaching the soil surface through the plant cover determine the formation of different runoff components.

At two sites in the Erzgebirge mountain region, different in altitude, but similar in soil conditions and plant stand, measurements of the abiotic environmental factors mentioned above were taken. The gradients of these factors are in correspondence with results of the general climatic characterisation of this region. Furthermore, experimental investigations of the processes of interception, infiltration, runoff formation, soil moisture storage, snow-cover accumulation and depletion, and transpiration were carried out. Different methods, such as micro-meteorological, soil-physiological, and hydrological, were applied to investigate transpiration. The results of the experiment also provided all input variables and parametres required for the application of a mathematical model. The results obtained by experiments and models provide an insight into the complex and time-varying ecohydrological processes, dependent on the altitude of the investigation site. At higher elevations it is generally seen that, as a

consequence of higher precipitation and lower temperatures, the soil water availability for plants increases. However, the atmospheric evapotranspiration demand is often lowered and therefore the transpiration decreases. But, during different weather situations (e.g., inversions, foehn), reversed correlations were observed. Some other results from the comparison of ecohydrological processes at sites differing in altitude are discussed in detail in the paper.

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