Influence of Species-Specific Bark Structure on the Spatio-Temporal Variability of Net Precipitation to Forest Soils

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In line with the objectives of the Helmholtz Association’s Terrestrial Environmental Observation (TERENO) network, the proposed study seeks to collect data regarding bark structural characteristics of dominant tree species during a month in summer 2013, and evaluate their influence over water relocation and exchange processes in forests. Levia & Herwitz (2005) reported that > 45,000 L of water ha\(^{-1}\) can be stored in tree bark surfaces during a single storm, and recent studies using newly-developed technology (LaserBark automated tree measurement system) in a similar US-based observation site have shown that species-specific bark microstructure can also significantly affect the timing and amount of water flux to forest soils, particularly about the tree stem (Levia et al., 2010; Van Stan & Levia, 2010; Van Stan et al., 2011). As changing climatological conditions will no doubt affect tree species composition, understanding the influence of bark structural characteristics on water cycling for species within forested TERENO sites is integral to the goal of monitoring and characterizing “climate-induced alterations in hydrological regimes” (TERENO website, accessed Dec. 16, 2011). Since current work investigating the effect of species distribution change on hydrological processes is limited by the absence of quantitative bark data, the proposed study aims to: (1) provide such data by collecting high-resolution bark scans using the newly-developed LaserBark system (Van Stan et al., 2010) and bark samples from 4 common European tree species (*Fagus sylvatica* L. European beech, *Quercus petraea* Liebl. sessile oak, *Quercus robur* L. pendunculate oak, and *Betula pendula* Roth. silver birch); and (2) relate bark roughness, microrelief and water storage values to the spatio-temporal variability of the Hohes Holz site’s long term throughfall and stemflow (net precipitation) hydrologic monitoring network. As high-resolution bark surface measurements have been unattainable prior to the development of the LaserBark system, this would represent the first study to relate such precise data to critical hydrologic contributions (net precipitation) to the ecosystem functioning of any forest.