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Soil properties in different types of Eucalypt Plantations in a small forested watershed, north-central Portugal

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The main aim of the HIDRIA project is to improve the knowledge and understanding of factors and processes that determine the hydrological behaviour of forested foothills in the Caramulo mountain range, North-Central Portugal. The changes from natural forest cover to Eucalyptus plantations in the last decades in Portugal is present in Serra de Cima catchment, one of the four experimental catchments monitored within the framework of the project. The objectives of the present study are to determine the effects of these changes on soil properties, and to improve the parameterization of the SWAT model to simulate the impact of land-use changes associated with forestry practices on hydrological processes.

The study catchment (Serra de Cima) is located in the Águeda Basin, draining the foothills of the Caramulo mountains east of Águeda (40º36'N, -8º20'E). The climate is wet Mediterranean with a mean annual precipitation of about 1600 mm at 445 m a.s.l. Soils are generally Umbric Leptosols (<30 cm depth) and Humic Cambisols. The Serra de Cima catchment has an area of 0.52 km2 and is covered by commercial eucalypt plantations (73% of the total area) and natural/degraded pine forest (27% of the total area). Eucalypts are managed as Short Rotation Coppices, with each stand growing during 30-36 years; trees are cut every 10-12 years and stems re-grow from roots afterwards. The eucalypt stands in the study area differ in tree age, undergoing their first, second or third rotations. Climate, soil moisture and streamflow are monitored at the catchment.

The presentation will focus on the results of a field campaign done on June 2011 to characterize soil and vegetation properties for six points on eucalypt stands in different stages of growth, as well as pine stands. The parameters sampled in this campaign were selected based on a sensitivity analysis of the SWAT model, and included: tree density and diameter; Leaf Area Index (LAI); ground cover; profile description; dry bulk density; texture and rock content; organic matter content; intensity of Soil Water Repellency (Molarity of Ethanol Droplet test); and near-saturated hydraulic conductivity (mini-disk experiments). There were clear differences in almost every parameter between eucalypt and pine plots, but also for eucalypt stands of different ages, indicating an impact of eucalypt growth on the properties of the underlying soil. The repetition of some measurements is foreseen to evaluate their seasonal variability.