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Hydraulic characterization of Andean Andosols and Histosols

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Understanding of the water production of microcatchments in the Andean paramos of southern Ecuador requires characterization of the hydraulic properties of the organic soils. The dominant soils are Andosols and Histosols and the prevailing vegetation consists in Calamagrostis sp. (tussock-grass) and Plantago rigida. (cushion-plant). With funding from the International Foundation for Science (IFS, Sweden) the water retention curve of soil samples of the Quimsacocha paramo ($>$ 3700 m a.s.l.) were analyzed, using two methods. The multistep-outflow method (van Dam et al., 1992) was applied on Kopecky rings (100 cm3 in volume) and the soil water content and water pressure head, using Time Domain Reflectometry (TDR) and tensiometer probes, were simultaneously measured on large cylindrical undisturbed samples, with volume ranging between 20000 and 65000 cm3. The large samples were exposed under natural conditions permitting free drainage and evaporation. Prior to monitoring the water content and pressure head the samples were saturated. The TDR signal was regressed to the soil water content, and an overall coefficient of determination larger than 0.8 was obtained.

With both methods the water retention curve of the Andosol and Histosol soil samples was reconstructed in the pressure range 0 to -561 cm. For different pressure heads in this range a significant difference was found between the soil water content measured with the multistep-outflow method and the water content monitored on the large cylindrical samples. The multistep-outflow method seems systematically to overestimate the soil water retention, which according to Vereecken et al. (1989) is most likely due

to incomplete initial saturation of the soil sample and the extreme high organic matter content (Buytaert, 2004). A further research challenge is the in-situ determination, under natural conditions, of the water release curve of both soils.

Buytaert, W., 2004. The properties of the soils of the south Ecuadorian páramo and the impact of land use changes on their hydrology. PhD thesis. van Dam, J.C., Stricker, J.N. and Droogers, P., 1992. Inverse method for determining soil hydraulic functions from one-step outflow experiments. Soil Science Society of America Journal, 56: 1042-1050. Vereecken, H., Maes, J., Feyen, J. and Darius, P., 1989. Estimating the soil moisture retention characteristic from texture, bulk density, and carbon content. Soil Science, 148: 389-403.