Session to be submitted to (give number): Modelling hydrological and biogeochemical processes across scales OR Soil mapping, sensing and soil modelling across scales

On which Working Group do you want to participate (give number)?: WG 4: Linking data to modelling

HOW WELL TEMPERATE SOILS –DEVELOPED PEDOTRANSFER FUNCTIONS PREDICT WATER RETENTION FOR WEATHERED BRAZILIAN SOILS?

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The use of temperate soils-developed pedotransfer functions (TEPTFs) for modeling soils in Brazil is not uncommon, even though pedotransfer functions (PTFs) developed for Brazilian soils have already been published (Tomasella *et al*., 2000, 2003). This fact may lead to poor quality hydrological simulations and limited support for decision making. This work evaluates the performance of two well known TEPTFs, namely ROSETTA (Schaap *et al*., 2001) and EU-HYDI PTFs (Tóth *et al*., 2015), both based on soil texture (sand, silt and clay contents) and soil bulk density, in addition to organic carbon content, which is particularly also used in the EU-HYDI PTFs, for predicting water retention data for weathered Brazilian soils. We selected 480 soil samples from the Brazilian Soil Hydrophysical Database (not yet published). They were samples of the Ferralsols, Acrisols and Nitisols classes, which are soils with advanced stage of weathering and covering around 60% of the Brazilian territory. Taking into account both TEPTFs, the root mean squared error (RMSE) of the water retention dataset associated to each sample was calculated, as well as the average RMSE for each USDA textural class, if it had more than 10 samples. Under this framework, the textural classes in which the average RMSE was not compiled were the silt, loam, silt clay loam and silty loam classes. When we examined the clayed classes (clay, sandy clay and silty clay), the average RMSE ranged from 0.060 to 0.090 $cm^3.cm^{-3}$ for both TEPTFs. For the other textural classes, the two TEPTFs were in general more accurate, leading to corresponding average RMSE values of similar magnitude ranging from 0.020 to 0.060 $cm^3.cm^{-3}$. The exception was for the sand class in which the EU-HYDI PTFs were much less effective (RMSE= 0.069 $cm^3.cm^{-3}$) than ROSETTA (RMSE= 0.026 $cm^3.cm^{-3}$). The performance of ROSETTA was slightly better than the EU-HYDI PTFs for most of the other textural classes. One fact that might explain the worse performance of TEPTFs in weathered clayed Brazilian soils is the commonly found fine granular structure of their profiles, which, in general, impose on them a structural behavior similar to sandy soils, in terms of high saturated hydraulic conductivity and aeration capacity as well as low water holding capacity. This is recognized in the literature (Tomasella *et al*., 2000) as the so-called 'hybrid' behavior of the weathered clayed Brazilian soils and it is associated with pedogenesis and mineralogical conditions of the weathered clays in Brazil.

We recognize that the development of universal PTFs, based only on texture, bulk density and/or organic carbon information is surely a very difficult and maybe a not feasible task, as also highlighted by Hodnett and Tomasella (2002), unless additional information related to pore space structure is used as input data. Our results also suggest that both EU-HYDI PTFs and ROSETTA are useful tools for water retention prediction of Brazilian soils with the exception when considering clayed soils.

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