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[C1.2-2] Soil Data, Spatial information Systems and Interpretation Procedures

Hydrophysical Database for Brazilian Soils: Challenges and Perspectives

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Access to soil hydrological data is vital for hydrologic projects and for supporting decision-making in issues related to the availability of food and water, as well as natural disasters.

Brazil, a country of continental dimensions, has accumulated a significant body of soil information, and holds a prominent position in the studies of tropical soils. In this study, hydrophysical database derived from Brazilian scientific publications is discussed. We developed a metadata describing the methods of determining some soil hydrophysical attributes and also presenting the characteristics of the site where these soil properties were estimated. Statistical analyses were performed to characterize the dataset based on the metadata-based data structure.

Total of 8,725 samples (without considering replicates) had soil moisture retention information associated with physical or chemical properties, such as organic matter content, granulometric fractions, bulk density, particle density and penetration resistance. Total of 63% of the publications present data of moisture retention related to determinations of organic matter (or organic carbon), granulometry and bulk density. The distribution of the samples with water retention information across the Brazilian territory showed that some regions were better represented than others, especially the Southeast and Midwest, where 2,245 and 2,321 samples were obtained, respectively. The North region lacks adequate representation, considering its social and environmental importance to the country. All Brazilian soils classes were represented. Two dominant soil types were Latossolos (FAO Ferrasols) and Argissolos (Acrisols, Lixisols or Alisols, according to FAO). This amount of soil water retention measurements also represented both topsoil and subsoil very well. All texture classes, except those with high silt content, were well characterized.

Total of 1,253 samples with saturated hydraulic conductivity measurements associated with water retention measurements were also found. The study showed that these data could not represent all Brazilian soil classes satisfactorily, neither the Brazilian states, in particular the ones in North and Northeast regions. Surprisingly, little appears to be known about the unsaturated hydraulic conductivity, as only 30 samples were analyzed.

The results analysis suggest that it is possible to develop a hydrophysical database on Brazilian soils that is all-encompassing, representative, with substantial volume of available data, homogeneous with respect to the methods of measuring soil properties and relatively diverse with respect to the physico-chemical properties. Some information on data quality needs to be collected.

The challenge in the development of the Brazilian soil hydrophysical database is to refine a data model that can encompass the wide range of available information and that meets the different kinds of queries of interest to different users in soil sciences. A preliminary structure of the database is in development. Considering the size of the Brazilian territory it would be of interest that the database development should become a joint effort of government agencies, universities and commercial enterprises.