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Orbital and laboratory spectral data to optimize soil analysis

J.A.M. Demattê (1), P.R. Fiorio (2)

(1) Soil Science Department, University of São Paulo, Escola Superior de Agricultura "Luiz de Queiroz", 13418-900, Piracicaba, São Paulo, Brazil, jamdemat@esalq.usp.br, (2) Enginnering Department, University of São Paulo, Escola Superior de Agricultura "Luiz de Queiroz"

There is a great demand for soil analysis all over the world. Soil analysis is the basis for soil classification, mapping, chemical management, land use and environment planning, polluent monitoring, and many other applications. The most important measurement of soils is the traditional-wet soil analysis. On the other hand, environmental and agricultural needs, demands faster information. Community efforts have been taken to determine an alternative to assist this issue. Remote sensing is an important technique that can do this task. Although the potential is systematic proved, many doubts still remains. The objective of this work was to evaluate the contents of soil attributes by laboratory and orbital sensors and identify its relation with traditional laboratory variability. The study area is located in, Brazil, in a 474 ha bare soil area. A 1 ha grid was established, where each point was sampled and analysed (traditional laboratory) at two depths (0-20; 80-100 cm), with a total of 948 soil samples. Laboratory soil reflectance data was acquired (450-2,500 nm). For the same pixels, reflectance data was obtained from a TM-Landsat image (atmospheric processed; reflectance transformed). Two spectral models (multiple linear regressions) were developed: one for spectroradiometric laboratory data and the another for TM-Landsat. The regression equations were developed for 50% of the samples and the other 50% used to validate the models. Validation procedure indicated (for spectral laboratory measurements) R^2 values for clay, sand, CEC, sum of cations (SM) and organic matter (OM), 0.84, 0.85, 0.66, 0.65, 0.42, respectively. Orbital estimation reached the following R^2 values: 0.72, 0.72, 0.64, 0.63, 0.35, for clay, sand, CEC, SC and OM: respectively. Data shows that physical components (such as clay) of soils presented better results than chemical ones (such as SC). Laboratory data is more precise, although orbital data presented expressive information, considering all factors that interpheres (atmospheric and surface soil conditions, distance of the target, 800 km). A second strategy was used to compare data. We observed a report about several traditional laboratory soil analysis and the variations between results. It was observed that significative variations exist between results for the same element. This variation was used to determine ranges (confidence intervals) of acceptance for the spectral measurement. Laboratory spectral data for sand presented 84% of its measurements in the laboratory confidence interval, 4% below and 13 % higher. Similar data was observed for clay. SC obtained 38% of agreement. The tendency of the spectral readings was to be higher than the traditional data. Another analysis presented that most of spectral data got in a 0 to 20% tolerance error for traditional soil analysis. For sand 77% was in the range acceptable for traditional analysis. Data showed that it is possible to substitute and/or complement some soil attribute contents information using laboratory and/or orbital data depending on the necessity/strategy of the work. **Key words:** Soil analysis, remote sensing, soil attributes, soil reflectance, chemical analysis, physical analysis.