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# Pedotransfer functions to mapping total and adsorbed phosphate using Vis-NIR (DRS)

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**Pedotransfer functions to mapping total and adsorbed phosphate using Vis-NIR (DRS)**

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Soil oxides-Fe can be an excellent predictor of spatial variability of total and adsorbed P, contributing to rapid mapping, low cost and differentiation of minimum areas of phosphate fertilizer management. In the Western Paulista Plateau (Brazil) were collected 300 soil samples representing the lithological (sandstone and basalt) and geomorphic variability (less, moderately and highly dissected), at a depth of 0.0 – 0.2 m. The total ($P_{total}$) and adsorbed phosphorus ($P_{ads}$) determined by conventional methods and hematite and goethite by X-ray diffraction (XRD). By partial least squares regression (PLS) and chemometric calibration, internal validation and external calibration, the Ptotal and Pads were estimated by diffuse reflectance spectroscopy (Vis-NIR-DRS), using hematite (Hm) and goethite (Gt) as a predictor. Then, the spatial pattern was obtained by geostatitic analysis. Phosphorus ware influenced by geology and dissection of the landscape and is a covariate of Hm and Gt, important indicators of environments with high or low P adsorption and content potential. Partial least squares (PLS) regression analysis of the spectral data demonstrated the influence of iron oxides on $P_{total}$ and $P_{ads}$, whereby Hm affects the former and Gt the latter. The lower maximum phosphorus adsorption capacity indicates the scarcity of P minerals and Fe oxides from sandstone sediments, with severe risk of phosphate loss and environmental damage. Significant correlation between $P_{total}$ and Hm and $P_{ads}$ and Gt in Vis-NIR-DRS indicates the potential of this study in mapping large areas based on iron oxides, which can be used to develop soil P

inventories as well as monitor and estimate the future impacts of land use, considering the complex relations between soil and landscape.

**Keywords:** Diffuse reflectance spectroscopy, goethite, hematite, geostatistics.