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Modelling of bulk density as related to aggregate size distribution in clayey Ferralsols

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Among microaggregated soils, there are Ferralsols that show little or no distinct horizonation. Their macrostructure is weak to moderate and they have typically a strong microstructure. In most Brazilian clayey Ferralsols, physical properties are closely related to the development of microstructure that consists of subrounded microaggregates 50 to 500 μm in diameter. They correspond to the pseudosand, micropeds, granules which were described earlier. Our objective was to show that in these soils bulk density (D_b) can be modelled according to microaggregation development and clay content.. The soils studied are located in the Central Plateau in Brazil. We measured the bulk density, aggregate size distribution, particle size distribution, and main chemical properties from the surface down to 160 cm depth in two soils under native vegetation and three others under pasture. Backscattered electron scanning images (BESI) of microaggregation were recorded using polished thin sections. BESI showed that microaggregates were either in loose assemblage or close assemblage. Aggregates size distribution enabled the measurement of the proportion of microaggregates in loose (Φ_L) and close assemblage (Φ_C) in every soil with respect to depth. Our results also showed that a linear relationship between the reciprocal of D_b and Φ_L or Φ_C can be established. Finally, in order to avoid D_b variation because of texture variation alone, a linear positive relationship between D_b and Φ_L that takes clay content into account is proposed. The latter enables the estimation of the microaggregation development using D_b as single estimator.