Kaolinite cristalinity index of Latosols as environment indicator of the Brazilian Central Plateau geomorphologic surfaces

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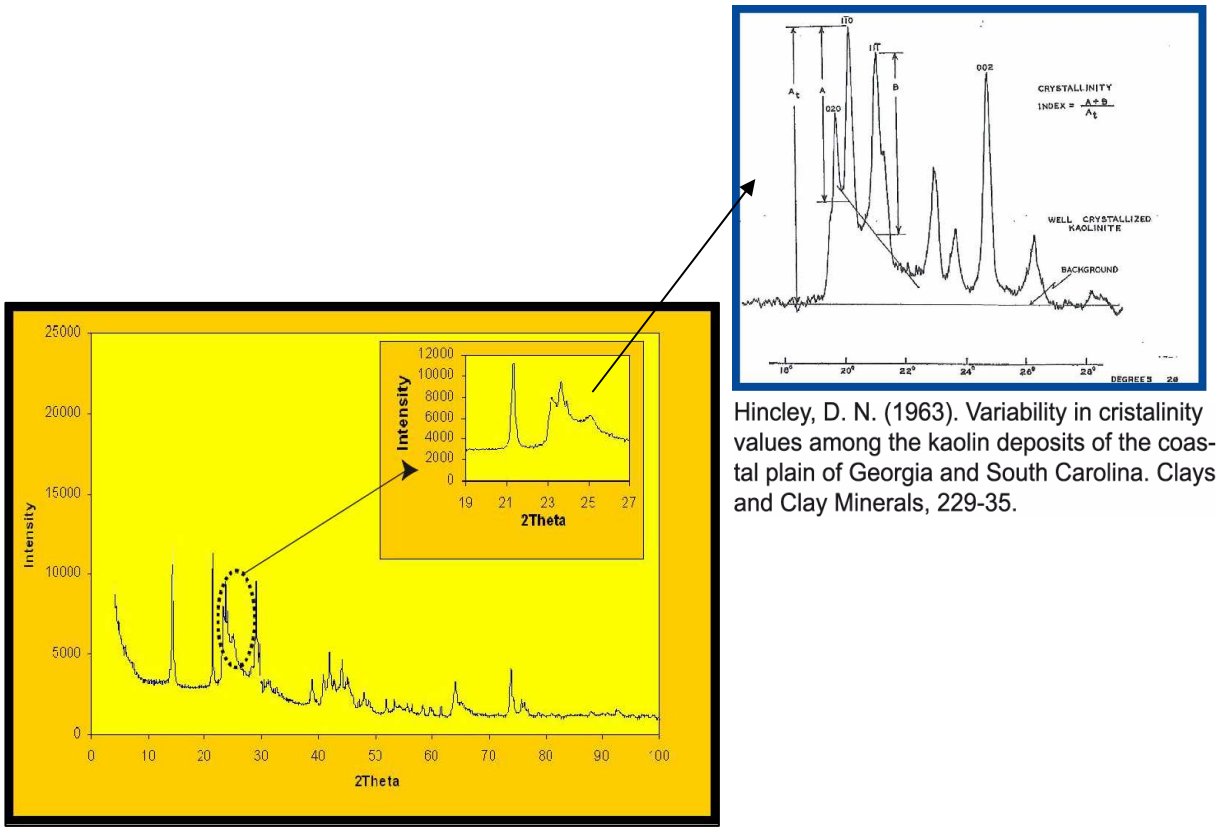
The Brazilian Central Plateau is constituted of the South American Surface and Velhas Surface geomorphologic surfaces and represents 24% of the Brazilian territory. Latosols cover about 40% of these Surfaces. Kaolinite, gibbsite, goethite and hematite were recognized in different proportions in the clay fraction of Latosols by many authors. The objective of this work was to analyse the kaolinite cristalinity and to discuss its variability according to the Latosol location on the geomorphic Surfaces of the Brazilian Central Plateau.

Ten Latosols (L) developed in different parent materials were selected for study along an approximately 350 km long regional toposequence across the South American Surface (L1 to L4) and Velhas Surface (L5 to L10). Samples were collected in the diagnostic horizon (Bw) of these Latosols. Chemical composition obtained after dissolution in sulfuric acid was used to estimate the kaolinite, gibbsite, goethite and hematite content. Goethite and hematite content was also estimated using the soil color (hue, value and chrome). The mineralogical composition of the oriented < 2 µm fraction was also determined by using X-ray diffraction (Thermo Electron ARL`XTRA, Cu tube, 0.05^0 2θ step). The Hincley index (1963) was used to quantify the kaolinite cristalinity in the non-oriented clay fraction X-ray diffraction (INEL XR3000 transmission, Co monochromator, Co tube, sample inside a capillary 0.5mm in diameter, resolution 0.03), Figure 1.



Hincley, D. N. (1963). Variability in cristalinity values among the kaolin deposits of the coastal plain of Georgia and South Carolina. Clays and Clay Minerals, 229-35.

Kaolinite (K) (110): d = 0.436nm, $2\Theta_{Co}$ = 20.34°
Kaolinite (K) (111): d = 0.436nm, $2\Theta_{Co}$ = 21.59°

Figure 1 – Example illustrating Hincley index in the clay fraction X-ray diffraction of Latosols studied.

The results showed that the variation of the kaolinite cristalinity index (K_{CI}) was closely related to the kaolinite/gibbsite (*RKGb*) ratio as shown by the following relationship:

$$K_{CI} = -0.9603\ RKGb + 1.2752\ (R^2 = 0.8653),\ \text{(Figure 2)}$$

They showed also a greater kaolinite cristalinity index and a smaller kaolinite/gibbsite ratio for the Latosols of the South American Surface (L1 to L4) than for those of the Velhas Surface.

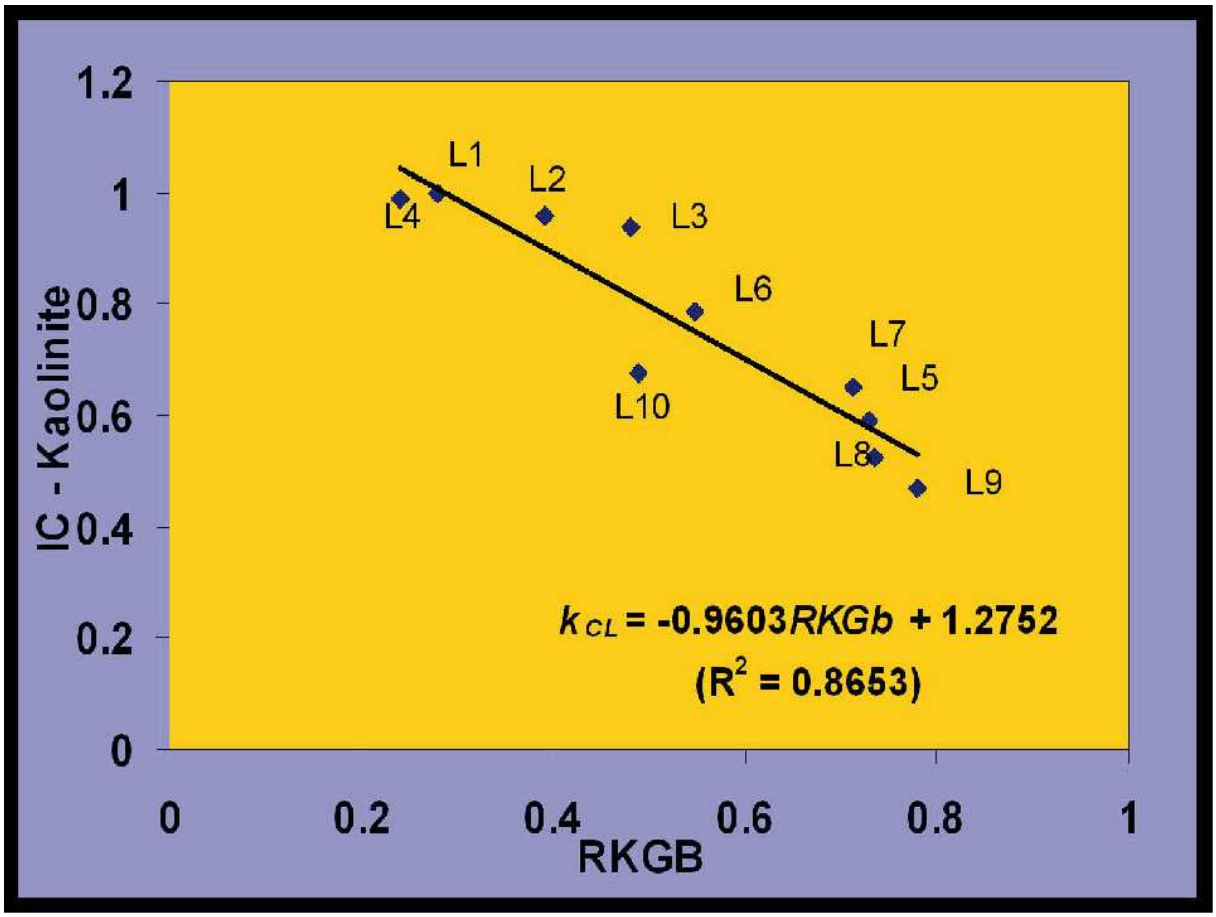


Figure 2 – Relationship between kaolinite cristalinity index (K_{CI}) and kaolinite/gibbsite (*RKGb*) ratio for Latosols (L) of the Brazilian Central Plateau.