Variability of chemical, mineralogical, and morphological attributes of five soils of the Guabirotuba formation

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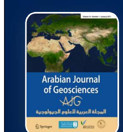

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Abstract

Problematic soils, such as expansive clay-rich soils, need geological and geotechnical assessments before commencing any construction project. The mineralogical composition of the soil plays a crucial role in determining its physical and chemical behavior, ultimately affecting its stability and susceptibility to erosion. This study analyzed the variability of

chemical, mineralogical, and morphological attributes of five soils of the Guabirotuba formation. Samples in different areas of Curitiba and the metropolitan region were collected. Chemical composition by X-ray fluorescence spectrometry (XRF), mineralogical composition by X-ray diffraction (XRD), and microstructure by scanning electron microscopy (SEM) were determined. The results showed that the five soils have a similar chemical composition, with silicon dioxide and aluminum oxide being the main constituents. The mineralogical composition varied in all analyzed soils. However, they belong to the same geological formation, and certain conditions, such as weathering, pressure, cation exchange, and climate, may differ in their mineralogy. Four of the five soils analyzed showed low expansion capacity due to kaolinite, characterized by low swelling potential and water adsorption capacity. On the other hand, one of the soils presented expansive potential because it did not have the presence of kaolinite in its mineralogical composition. Finally, the variability of soil characteristics changes from one place to another. Although they have similar chemical compositions, the cation exchange and mineralogical composition contribute to the development of several behaviors that can be useful for decision-making about the destination of said soil.

Soil Physics | Soil Science

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Ethics declarations

Competing interests

The authors declare no competing interests.

Additional information

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