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# Geotechnical characterization of soils from a slope of the Serra do Mar, susceptible to landslides.

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**Abstract**
The mass gravitational movements are processes of transport of soils, rocks or vegetation, due mainly to the gravity force. These movements are characterized by the shear rupture of the soil and/or rock. Landslides is the most common type of gravitational movement in the climatic and geological dynamics of Brazil. The Serra do Mar (Sea Mountains), which extends for approximately 1,500 kilometers along the Brazilian east / south coast, presents a great incidence of these movements, because of its geomorphological, geological, climatic and vegetation characteristics. The objective of this research is the physicochemical and geotechnical characterization of soils collected from a slope of the Serra do Mar, susceptible to translational landslides.

***Key words:***
*Mass gravitational movements, Serra do Mar, Geotechnical Characterization.*

## Introduction

Mass gravitational movements (MGM) are solid mass transport processes of surface dynamics induced by the gravity force. There are several types of MGM, involving several materials, processes and conditioning factors.
In recent years, MGM were one of the phenomenon responsible for producing the highest numbers of victims and damages in Brazil. The Serra do Mar, located mostly on the coast of southeastern Brazil, is one of the main geographic locations where these types of events occur.
Six soil samples corresponding to three different soil horizons (A, B and C) were collected from a slope of this region. These samples were submitted to geotechnical and physicochemical characterization tests, which followed the current Brazilian Standards.

## Results and Discussion

The soil sample of the most superficial horizon (A) presented lower values of specific mass of the solids (2.53 g/cm³) and dry specific mass (0.86 g/cm³), when compared to the two deeper horizons (B and C) (2.69 g/cm³ and 1.47 g/cm³, respectively). Low values of the dry indicates the presence of a greater number of voids and, consequently, greater porosity of this soil.
The soil consistency parameters (Chart 1), only the horizons A and C presented a high plasticity, which occurs when the plasticity index is greater than 15%. This reflects a greater capacity of this soil to be shaped without cracks.
The majority of the soil samples presented the same textural classification. In the presence of the deflocculant, the samples were classified predominantly as clay-silty sands, and in the absence of the deflocculant, as silty sands. This fact occurs due to micro aggregation, which is illustrated by the different grain size distribution curves (Figure 1).
The soil samples pH was around 5.2 for the horizon A, and 4.4 for the deeper horizons (B and C). The cation exchange capacity (CEC), which indicates the presence of organic matter and expansive clay mineral, decreased along the depth.
The permeability of the horizon (B) presented values of the order of 10^-5 cm/s. It was possible to perform the permeability test only to this horizon, due to the lack of undisturbed samples from the other horizons.

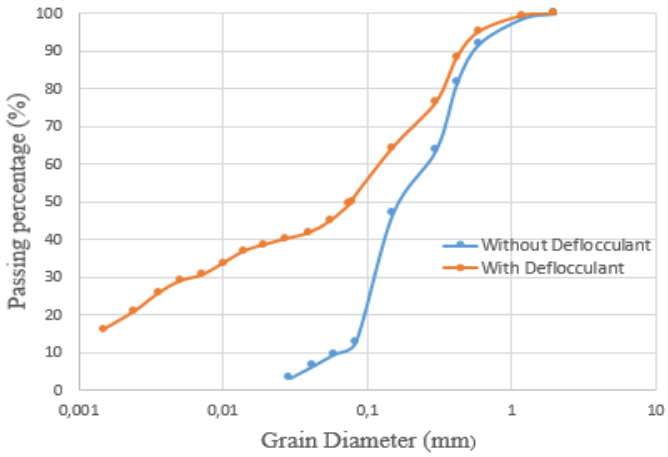


**Figure 1.** Granulometric curves with and without deflocculant.

**Chart 1.** Soil consistency parameters.

| Horizons | A | B | C |
|---|---|---|---|
| Liquid Limit (%) | 59,4 | 40.0 | 45.4 |
| Contraction Limit (%) | 14.3 | 20.9 | -- |
| Plasticity Index (%) | 21.0 | 12.9 | 18.9 |

## Conclusions

The micro aggregation present in the studied soil samples is characteristic of tropical soils and occurs mainly because the presence of cementing agents, which bind the fine particles of the soil (clay and silt). This aggregation entails an increase in void spaces and consequently, the permeability. Soils with greater permeability allow the dissipation of pressures in the water, avoiding the reduction of the shear resistance of the soil and, consequently, the landslides.

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