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Vertical and lateral particle and element fluxes across soil catenas in southern Brazil

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At the Earth's surface, mechanical disaggregation and chemical weathering transform bedrock into mobile regolith and soil. Downslope translocation of weathering products by lateral transport of soil particles and elements are determinant for the development of soil catenas. To grasp the rates of soil formation and development along catenas, we need better constraints on the vertical and lateral fluxes of particles and nutrients along hillslopes.

Our study aims to analyze soil catena development in a spatio-temporal framework. The data are collected in the central part of the Rio Grande do Sul State in southern Brazil. The sampling area is located on the Serra Geral plateau composed by rhyodacite rocks ($\sim$700 m.a.s.l). The climate is humid subtropical (Cfa), and the natural vegetation is characterized by deciduous tropical forest and native *Araucaria angustifolia* forests.

Two soil catenas with different slope morphology were selected: a steep slope of 190m long with maximum slope angle of 24°, and a gentle one of 140m long with a maximum slope angle of 11°. In total, eight soil profiles were sampled and 67 soil and 8 saprock or bedrock samples have been analysed for total element composition. Bulk densities were determined on undisturbed soil samples. The soil thickness varies along catenas with soil depths of about 90 cm on the ridge top, 30 cm on the convex nose of the steep slope and $>$2 m on the foot slope. Chemical mass balance techniques are used to constrain chemical weathering intensities (CDF) and absolute chemical mass losses or gains ($\delta_{j,w}$).

In each one of the eight soil profiles, we notice important absolute chemical mass losses for the most mobile elements (Na, K and Ca). The mass transfer coefficients of Al and Fe do not show a clear pattern, and largely depend on soil depth and position along the soil catena. The weathering intensity of the soil and the absolute chemical mass transfer are correlated with the residence time of the soil. Our data show a systematic increase in chemical weathering intensity with distance from the ridge top.