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# Phytoliths as indicators of Quaternary geomorphological dynamics in alluvial-colluvial ramps, Espinhaço mountain range, Minas Gerais, Brazil

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## Résumé

The Espinhaço Mountain Range is a mesoproterozoic tectonic deformation zone located in the eastern area of the state of Minas Gerais (Brazil). One of the most common features in this massif is the occurrence of outcrops of quartzite, which are interspersed with alluvial-colluvial ramps. The main objective of this work is to contribute to the understanding of the geomorphological processes that led to the formation of depositional ramps close to the quartzite outcrops, by inferring climate variations from phytolith and carbon isotope studies. Twelve soil profiles were sampled in three areas (Area 1: between Guinda and Diamantina; Area 2: Chapadinha – Gouveia; and Area 3: Morrinhos), totalling 45 soil and sediment samples. Topographical, grain size, phytolith, isotopic and organic carbon analyses and <sup>14</sup>C- AMS dating were performed. It was observed from the analysis of three alluvial-colluvial ramps that the geomorphological processes acted differently. In the three studied areas, the phytolith and isotopic results did not indicate any major changes in the type of vegetation over time, although variations have been found along the slopes. In Guinda and Morrinhos, phytolith stocks, varying in accordance with the particle size, do not follow the pattern of decreasing with depth. In Chapadinha, stocks decrease with depth. The D/P indexes were always low (06-29) and Bi indexes were very high (75 to 94% in Areas 1 and 2, 48 to 84 % in Area 3). In Areas 1 and 2, the phytoliths are highly weathered, indicating that the erosive processes are intense. In Area 3, the phytoliths are well preserved, suggesting greater geomorphological stability. In the three areas, the predominant types of phytoliths are those produced by grasses, especially parallelepipedal bulliform and cuneiform. In Area 3, despite the predominance of the bulliform type, phytoliths characteristic of Poaceae, such as bilobate, polylobate, cross and trapeziform types were also found, as well as the globular granulate type. The  $\delta^{13}\text{C}$  analysis indicates open vegetation with a predominance of grasses, especially the C4 type. Differences in regard to the greater or lesser presence of woody plants

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\*Intervenant

were most observed among the surface samples of the profiles of a same transect, or from one area to another, rather than along each profile. Another trend observed in all areas was the reduction of the presence of woody plants with depth (about 5700 cal years BP). The analyses indicate the predominance of savanna vegetation since 6038 years BP. The phytolith analysis associated with the geomorphology was found to be highly effective in understanding the evolution of the landscape and environmental changes. These analyses are of great relevance for the temporal reconstruction of the region and the interpretation of geomorphological processes operating efficiently in the transport and deposition of sediments in this region.

**Mots-Clés:** Geomorphological dynamics