Quaternary aeolian surface formations in the Brazilian Pampa

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In the western part of the state of Rio Grande do Sul, there are sandy spots (called areais) embedded in the landscape of the Brazilian Pampa biome. These sand spots are associated with unstable and/or stable aeolian deposits from the continental interior, and represent the legacy of drier climates than the present one, providing important paleoclimatic evidence for understanding the landscape evolution. Currently, the sand deposits, which have their genesis in dry climates, are subject, at the same time, to wind action, in dry seasons, and surface and subsurface erosions, in rainy seasons, which remobilizes the unconsolidated sediments, initiating the sandization process and the formation of sand spots. It can be stated that the stable eolian deposits exhibit forms remodeled by pluvial and fluvial erosions, still presenting different degrees of morphological preservation concerning those of the recent past, which is why the present hill relief can be associated with the Holocene longitudinal dune fields. However, these eolian formations still lack studies to determine their absolute geochronology and to understand if there were significant climatic fluctuations to infer if the region of occurrence of the sand spots was subjected to more severe conditions of aridity, which would allow the formation of eolian deposits in the interior of the continent. The study also aims to reveal whether the aeolian dune fields of the Brazilian Pampa correlate temporally with the paleoclimate signal of drier events that occurred in other regions of Brazil or South America (Colombia, Argentina, and Chile), in which aeolian activity seems to have been intense during the Last Glacial Maximum (LGM), particularly in the Holocene. Thus, to understand the past and present morphogenesis, it was considered to apply the geochronological method of Optically Stimulated Luminescence (LOE-SAR protocol) to establish the absolute ages of the sediments that make up the aeolian deposits, which, combined with sedimentological data, gave subsidy to the paleoclimatic and paleogeographical reconstitution of the region of occurrence of the stable and/or unstable aeolian deposits of the Brazilian Pampa. According to the results obtained, it was possible to infer that these sediments result from wind action, being the youngest layer to be remobilized and deposited in periods of climatic dryness, with sufficient semiaridity/aridity characteristics to give rise to wind deposits and dune fields, recognizable in the reading of the landscape at present. The particle size distribution of the four collection points indicated sandy textural classification (above 92%), composed of quite homogeneous material, frankly sandy, friable, and unconsolidated, showing that these are well-selected sediments originating from wind transport, a finding confirmed by the distribution of the sand fraction in a fine sand model class above 54% for all the profiles analyzed. The results obtained by LOE-SAR established three climatic drying peaks that occurred during the Holocene. The first episode, 8,200 ± 700 BP, coincides with the end of the Lower Holocene; the second episode, 5,650 ± 1,120 BP, corresponds to the Middle Holocene; and the last episode, 1,910 ± 275 BP, corresponds to the Upper Holocene.