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LATE HOLOCENE DUNE DEVELOPMENT AND PROVENANCE CHANGES IN THE SÃO FRANCISCO DO SUL COASTAL BARRIER AS A RESULT OF COLD FRONTS INTENSIFICATION IN SOUTHERN BRAZIL

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Resumo

Holocene coastal barriers from southern Brazil present great geomorphological changes during their late stages of development. In this study, we investigate the Holocene evolution of the São Francisco do Sul (SFS) that stands out among the southern Brazilian barriers due to its well preserved morphology with a parabolic dune belt in the seaward portion. Forty five sediment samples for grain-size an heavy mineral analyses were taken from five different geomorphological units on the eastern part of the barrier: foreshore, foredunes, blowouts, parabolic dunes and beach ridges. Chronological framework was delineated through OSL-SAR dating on eleven samples. There is conspicuous sand coarsening from the inner units to the outer seaward units. The heavy minerals concentration on the very fine sand fraction present huge variation within and among the studied geomorphological units. Higher concentrations of rutile, kyanite, sillimanite and staurolite point to a metamorphic-dominated provenance of the beach ridge sediments. In turn, all other units show higher contents of zircon and hornblende, suggesting a greater contribution of sediments derived from igneous rocks. A conspicuous association between geomorphological units and the RZi (rutile-zircon index) can be observed. In addition, sediments from the beach ridges differentiate themselves from all other geomorphological units due to their rounded to sub-rounded zircon grains in contrast to more euhedral to subhedral forms found on other units. The OSL dates follow an expected temporal progression based on their geomorphological positions, indicating a prograding coast. This chronology supports a depositional model of wave-dominated beach ridges progradation followed by the development of superimposed parabolic aeolian dunes in some locations. Beach ridges without or with limited dune cover are older than 3.3 ± 0.2 ka. whereas parabolic dunes show ages younger than 1.9 ± 0.1 ka. The progradation of the SFS barrier started at least 4.9 ± 0.4 ka. and had a pronounced morphodynamic shift around 1.9 ± 0.1 ka. This shift is characterized by episodic development of parabolic dunes migrating to NNW associated with sand coarsening and a marked variation in sediment provenance represented by the input of sands derived from local coastal watersheds southward from the SFS barrier. This morphodynamic-provenance shift resulted from the strengthening of SSE winds and associated wave systems responsible for the northward alongshore drift. In turn, this suggests an intensification of cold fronts and ENSO coupled with higher precipitation since 1.9 ± 0.1 ka. OSL dating combined with grain size, heavy minerals and geomorphological analyses allowed assessing the response of coastal barriers to the impacts of centennial to millenial climate events occurred during the Late Holocene.