

# **Changes in sediment provenance and coastal morphology forced by cold fronts intensification in Southern Brazil during the Late Holocene: The record of the São Francisco do Sul barrier**

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The provenance and luminescence chronology of beach ridges sands and superimposed dunes sands are investigated in São Francisco do Sul Island (SFSI), a regressive Holocene barrier in Southern Brazil. Forty five sediment samples were taken from the present beach, foredunes, blowouts, parabolic dunes and beach ridges, mostly from the eastern part of the barrier, for grain-size and heavy minerals analyses. Eleven samples were taken for Optically Stimulated Luminescence dating using the Single-Aliquot Regenerative protocol (OSL-SAR) in an area of 7 km<sup>2</sup>. Medium sand predominates in all categories, except on the beach ridges where fine sand prevails. Higher concentrations of rutile, kyanite, sillimanite and staurolite and higher RZi (rutile-to-zircon ratio) and TZi (turmeline-to-zircon ratio) values point to a metamorphic precambrian substrate northward the Perimbó shear zone as the main source of the beach ridge sediments. Conversely, all other units show higher contents of zircon and hornblende and lower RZi and TZi values, suggesting a greater contribution of sediments derived from southward acid igneous rocks. Also, zircon grains from the

present beach, foredunes, blowouts and parabolic dunes are represented by euhedral long-prismatic grains with typical magmatic length to width ratios of 3:1. The plutonic origin of these sediments may be traced to the Florianopolis Batholith located less than 170 km south from SFSI. The OSL-SAR ages range from 0.087 to 4.54 ka, covering the Mid- to Late-Holocene. These ages follow expected temporal progression based on their geomorphological positions, indicating a prograding coastline and supporting a depositional model of wave-dominated beach ridges that in some locations may have superimposed dunes. Beach ridges without dune cover are older than 3 ka whereas parabolic dunes show ages younger than 1.9 ka.

A morphodynamic shift occurred in SFSI at 1.9-1.8 ka indicating conditions of stronger northward littoral drift and SSE winds that brought enough dune-forming sediments decoupled from sediments from the previous beach ridges. The development of parabolic dunes between 1.9 and 1.2 ka superimposed to beach ridges were controlled primarily by enhancement of cold fronts, probably provoked by a northbound shift of the Westerlies. This climate forcing on the coastal system generated changes in the barrier morphology, sediment provenance and supply and timing of deposition. Different facies correlation in barrier systems as shown in a small area of SFSI may act as a valid proxy for past climate events. OSL-SAR dating combined with grain-size, heavy minerals and geomorphological analyses are reliable in evaluating impacts of centennial to millennial climate changes on coastal depositional systems. Understanding the coastal zone as a source-to-sink system and its sensitivity to climate change may help evaluating the response of coastal zones to future climate changes.

PALAVRAS CHAVE: SÃO FRANCISCO DO SUL, PROVENANCE, OSL DATING, WESTERLIES