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Reconstructing sea level from Holocene coastal barrier stratigraphy

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Present and future context of sea-level rise has revived the debate around sea-level changes through the deglaciation and mid- to late Holocene, arising the need for high-quality reconstructions of regional sea level, in particular at those areas where not clear consensus exists. Here, we explore the stratigraphy of a sandy barrier to identify the best sea-level indicators and provide a new sea-level reconstruction for the Atlantic coast of the Iberian Peninsula, covering the past 6.5 ka.

Selected indicators represent morphological features extracted from the stratigraphy of a coastal barrier; namely the beach berm and the dune-beach contact. These features were mapped from high-resolution ground penetrating radar images of the barrier subsurface and transformed into sea-level indicators by applying modern analogs and a chronology based on optically stimulated luminescence ages.

Our reconstructions document a continuous but slow sea-level rise after 6.5 ka with an accumulated change in elevation of about 2 m with superimposed small oscillations (< 15 cm). The latter suggest small-scale changes in sea-level rise or the morphological response of the barrier to paleoclimate variability. In the context of SW Europe, our results show good agreement with previous works, including the Tagus isostatic model, but major minor with reconstructions obtained from estuarine sediments, demanding further improvement of regional solutions. This work reinforces the potential of barrier indicators to accurately reconstruct high-resolution mid- to late Holocene sea-level changes through simple approaches.