Sedimentology, stratigraphy and landscape evolution of a coastal dune system, Traba, NW Spain

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The main objective of this work is to explore the internal structure and the evolution of Traba coastal dune complex associated to energetic shorelines in temperate and humid coastlines. Morphologically, Traba dunes are characterized by the presence of different types of blowouts, however this study will focus only on the two better developed blowouts: a trough and a saucer types. The internal structure of the blowouts was delineated using a dual frequency antenna (600 and 200MHz) Ground Penetrating Radar (GPR) from IDS. The GPR system was synchronized to a RTK-GPS. Topographic corrections were applied assuming a radar velocity of 12 cm/ns. This radar velocity was calculated by fitting diffraction hyperbolas. Kingdom SMT software was used for the interpretation of the 2D GPR transects. A total of three cores were collected along the saucer blowout using a Tess-1 suction corer and auger borings to identify the sedimentary features of the facies previously identified in the GPR profiles. Water table depths were also groundtruthed with the cores. The corers were macroscopically described and sampled every 10 cm for laboratory analysis. Thirteen vertical aerial photographs from 1945-2008, have been used to obtain information on blowout establishment, growth, reactivation and migration. The comparison and superimposition of successive geocorrected images allowed a dynamic plan view visualization of blowout development and evolution through time, which could be projected to a third or depth dimension by integrating the geophysical data.

The linking between geophysical information provided by GPR and aerial imagery constitutes a suitable tool to describe the geomorphological evolution of these sedimentary bodies at different spatial scales from km to cm. The primary findings of this study are: (1) the identification of pre-blowout dunes, which were characterized by vertically accreted units of aeolian deposits; these blowout features overlie older deposits consisting of gray sands with organic-rich humic horizons, (2) the formation and migration of the blowouts is a decadal scale process that has been documented by aerial photography since at least 1985, (3) the combination of pre-existent topography, wind and wave erosion of foredunes (in trough blowout), and changes in the vegetation cover (in saucer blowout), determined the initiation of blowouts; (4) blowouts advance directions appears to be related to the predominant wind directions and (5) a detailed study of 2D lines indicates that the internal sedimentary structure of the depositional lobe is more complicated than expected, and this pattern is mainly related to changes in the vegetation cover. These results will be supported with additional information (e.g. wind and rainfall regime) in order to establish an evolutionary conceptual model for the evolution of this coastal landscape, in particular for the blowouts.

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