THE EVOLUTION OF A RETROGRADING SAND BARRIER AT CÍES ISLANDS (NW IBERIAN PENINSULA) (TALK)

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Barriers are dynamic and ephemeral constructions changing as they are modified by waves, winds and water currents. In this sense, retrograding barriers are the youngest of these coastal sedimentary environments. These barriers are controlled by storm overwash and tidal inlet deposition, and are associated with coastal recession. Here we present an example of a retrograding sand barrier located at the NW Coast of the Iberian Peninsula. The internal structure and the recent evolution of this barrier are analysed in detail using ground penetrating radar (GPR) and geo-rectified aerial photographs to investigate accretion/recession trends and rates at this coastline sector.

Following the criteria proposed by Bristow (1995) and Bristow *et al.* (2000) we identified four different radar facies, which were related to specific sedimentary regimes: 1) Radar Facies Washover Sheet (RWS), characterized by sub-horizontal reflectors gently dipping landward, 2) Radar Facies Washover Delta (RWD), characterized by high angle reflectors dipping landward, 3) Radar Facies Beach Face (RBF), characterized by high angle reflectors dipping seaward, 4) Radar Facies Barrier Top (RBT), characterized by sub-horizontal reflectors indicating transition from the beach to the backbarrier environment (Fig. 1).

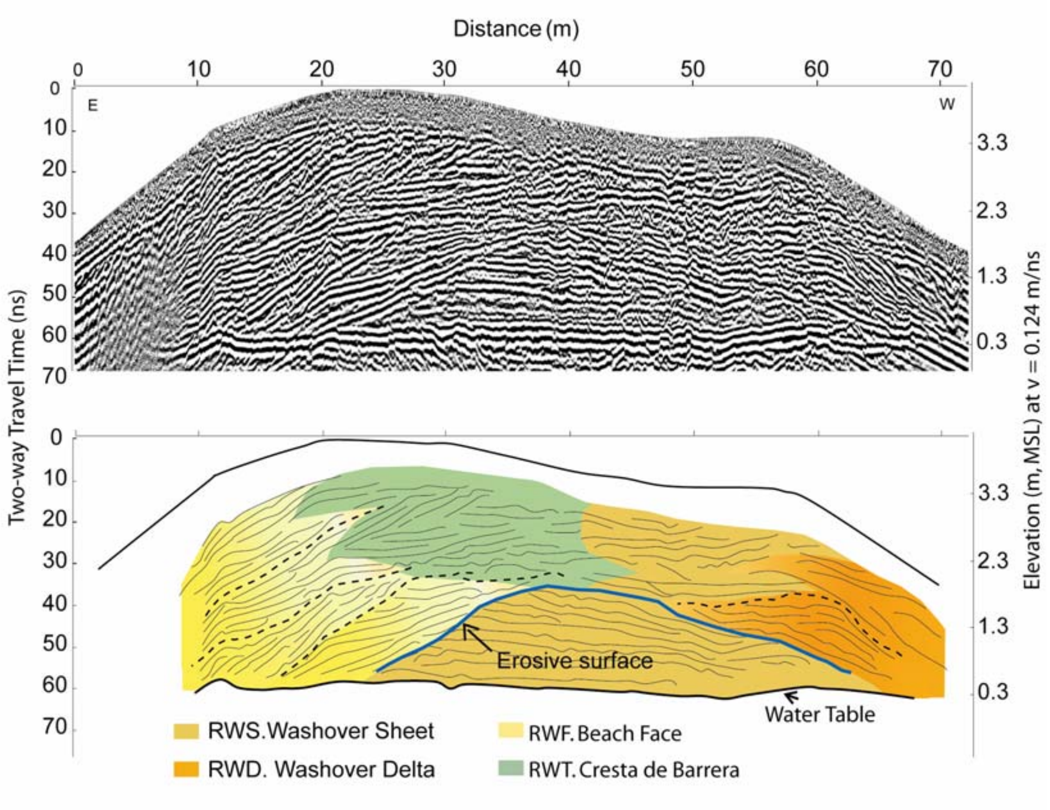

Figure 1 - a) Crosshore GPR profile T7 from beach face to the backbarrier. b) Interpretation of the profile radar stratigraphy including the succession of radar facies and discontinuity surfaces.

From the beach towards the lagoon, the barrier presents a gradual succession of the radar facies. On the other hand, the vertical radar facies succession is controlled by an erosive bounding surface resulting in a discordant bounding that separates RWS and RBF, so beach deposits overlap washover deposits (Fig. 1). This discordant succession of radar facies indicates that the barrier is migrating landward due to the advance of the beach face over washover deposits.

Aerial photo analysis, covering the period from 1956 to 2003 indicates that the evolution of the studied feature is non linear. From 1956 to 1985 the barrier experienced erosion and the shoreline retreated around 25 m. Maximum landward retreat was recorded in 1985. The position of the shoreline in this year coincides with the location of the discordant bounding surface in GPR profiles. From 1985 to 2003, the barrier presented a prograding trend, with seaward advance of the primary foredune. This reversal in the migration trend of the shoreline is recorded in GPR profiles as a seaward advance of the beach face.

Taking into account these results it was possible to develop an evolutionary model describing the behavior of the sand barrier throughout the last decades. In this sense, the barrier displayed a cyclical evolution in spite of net shoreline retreat during the studied period. The reversal of the evolution trend coincides with the sharp change in the North Atlantic Oscillation index (NAO) around the mid-1970s, from negative towards positive phase (Hurrel, 1995). On the other hand, the shoreline retreat rate observed at the studied area for the period between 1956 and 2003 was one order of magnitude higher than the expected using the approximation of the Brunn Rule (Bruun, 1954). The approximation takes into account the eustatic sea level rise, which was measured at Ría de Vigo tide gauge from 1942 to 2001 (2.91 mm/yr, Marcos *et al.*, 2005), and the mean beach face slope (β = 6º). These differences could be explained by the combination of two factors: (1) sand mining activities carried out in the studied barrier during fifties and sixties, and (2) the present negligible sediment input towards the sedimentary complex, which could have enhanced the effect of erosion at the study area increasing the observed retreat rate.

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