

# **CORRELATION BETWEEN THE FLUVIAL TERRACE STAIRCASES OF THE LOWER TEJO RIVER AND THE MARINE TERRACE STAIRCASES ADJACENT TO THE RIVER MOUTH (WESTERNMOST IBERIA)**

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This study provides new geomorphological and geochronological data (Electron spin resonance dating, ESR), allowing the characterization and correlation of the fluvial terrace (Tf) staircases of the Lower Tejo River (LTR) at reach IV with the marine terraces (Tm) adjacent to the river mouth, namely at the Raso and Espichel capes (western central Portugal) [2]. The terrace staircases are also correlated with the Marine Isotope States (MIS) and the control mechanisms that originated the marine and fluvial terraces are discussed.

Inland, the study area comprises the reach IV of the Lower Tejo River (Arripiado - Vila Franca de Xira), dominated by the Upper Pliocene – Lower culminating sedimentary unit of the Lower Tejo Cenozoic Basin (UBS13; the ancestral Tejo River before the stage of fluvial incision). The Middle to Upper Pleistocene is represented by fluvial terraces and an aeolian cover unit [4] [6]. Holocene sediments form an extensive alluvial plain, ca. 10 km wide in downstream part of the area.

Previous studies in reach IV, provided the characterization and dating (Qz-OSL, post-IRIR and ESR) of the six terraces levels present [1] [3] [7]. Using the terrace staircase of the left valley margin, several levels were identified: Tf1 at c.a 115 m (above mean sea level, a.s.l.) with a probable age of 950 - 850 Ka; Tf2 (82-72 m) with a probable age of 780-550 ka, Tf3, (60-50 m) is between 500 ka - 360 ka, Tf4 (38-20 m) has 335 - 155 ka, Tf5 (13-10 m) has 135-73 ka and Tf6 (-4 m) is between 62-30 ka. It was estimated an uplift rate of 0.10m/ka [3].

At Raso cape (Fig.1 A), four terraces below the culminating wave-cut platform (base of UBS13) at ~90 m a.s.l., 42-38 m (Tm1), 37-34 m (Tm2), 22-20 m (Tm3), 10-9 m (Tm4) were identified. The Tm2, comprising rolled boulders at the base, coarse to medium sands in the middle part and colluvium at the top, was dated by ESR (416±180 ka - Al; 437±67 ka - Ti). It was estimated an uplift rate of ca. 0.07 m/ka [2].

The Espichel cape (Fig.1 A, B) rises higher than the Raso cape, with the culminating wave-cut platform (base of UBS13) at 118 m and more. It has a marine terrace staircase composed by eleven terraces. In the western side of the cape, the marine terraces were identified as: Tm1 at 108 m a.s.l., 83m (Tm2), 74 m (Tm3), 68 m (Tm4), 53m (Tm5) and 45m (Tm6). The Tm7 at 33.6 m a.s.l., 25 m (Tm8), 18m (Tm9), 12m (Tm10) and the Tm11, at 8 m a.s.l. The Tm5 and the Tm7 were dated by ESR, (>343±10 ka and 417±40 ka (Al centre)), respectively. It was estimated an uplift rate of ca. 0.08 m/ka.

The ESR ages obtained in the study area were very important to propose a correlation between the marine and fluvial staircases and with MISs (Fig. 1C).

The higher number of marine terrace at Espichel cape in relation with Raso cape can be explained by the higher uplift rate.

The fluvial terraces, with larger thickness, could record longer intervals (probably related with more than one interglacial period). The sedimentation phase in the downstream river may be much longer in time than in a coastal stretch, controlled by the sediment supply and transport, the climatic oscillations, the source area uplift and the substrate present, while, the main driven mechanism that determines the accommodation space are the tectonics, glacial isostasy and the eustatic (base-level) changes.

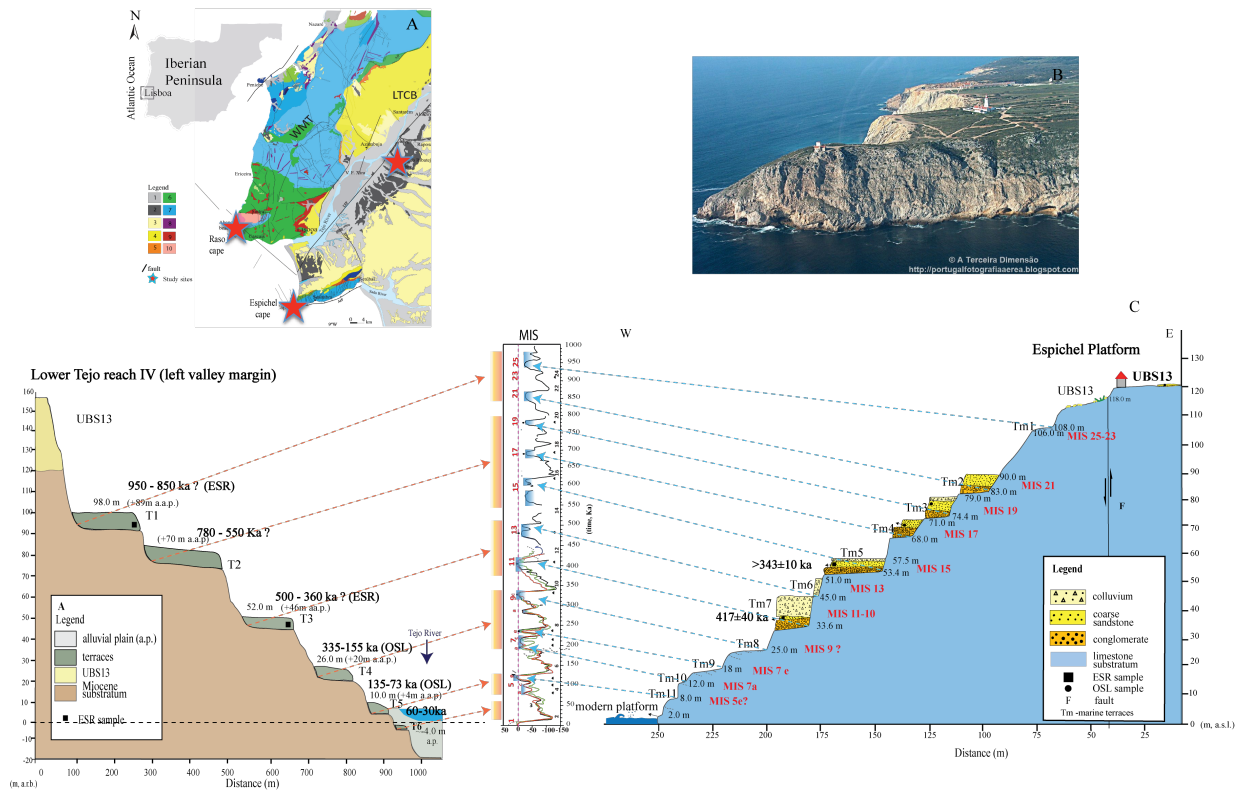


Figure 1. A- Geographical setting and geological map of the study area (adapted from Geological map of Portugal, 1/500 000, LNEG); B- Espichel Cape (photo from A Terceira Dimensão); C- Schematic terrace staircases of the Lower Tejo (reach IV) and Espichel Cape, with ESR and OSL ages; sea level estimates by [5]. Legend: WMT - Western Mesozoic Terrains; LTCB – Lower Tejo Cenozoic Basin. 1 - Holocene, 2 - Pleistocene, 3 - Pliocene, 4 - Miocene, 5 - Palaeogene; 6 - Cretaceous, 7 - Jurassic, 8 - Triassic, 9 - volcanic rocks, 10 - granite. The orange rectangles are the proposed aggradation intervals for the fluvial terraces.

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