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Depositional and erosional processes during the early postglacial phases in the Gulf of Cádiz shelf

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Melt-water Pulse (MWP) 1A involved a dramatic sea-level rise of almost 20 m over a few hundreds of years and had a significant influence on global climate [1, 2]. The MWP 1A sea-level rise favoured the drowning and preservation of coastline deposits whose development took place in response to still-stands or periods of slow sea-level rise [3]. In this contribution, we examine the facies and distribution pattern of an outer shelf deposit located in the northern shelf of the Gulf of Cádiz (NE Atlantic Ocean) that could have been developed during the initial postglacial transgressive stages.
A seismic stratigraphic analysis of an outer shelf sediment wedge was made, in addition to the analysis of a set of sediment cores collected in the study area.

The outer shelf sediment wedge abuts morphological highs of the inner shelf. The proximal seismic facies exhibit chaotic patterns, with isolated monticules and depressed areas. The deposit thickens towards the outer shelf, with a maximum thickness greater than 8 m. The seismic facies change seaward to tangential oblique, with some internal downlap surfaces, and to a low-angle, parallel oblique facies. Distally, it thins out in the vicinity of the paleo-shelf break.

The upper boundary of the sediment wedge is characterized by an irregular erosive pattern, in coincidence with the occurrence of indistinct, chaotic seismic facies. The upper boundary changes seaward to toplap with concordant terminations with a smoother profile. The outer shelf deposit is characterized by coarse-grained sediments mostly composed by bioclastic fragments of greater than 80 % abundance. Coral fragments collected at the top of the deposit top give an age of 14.7-13.9 cal ka. The outer shelf sediment wedge is considered to have been deposited in a transgressive context postdating the Last Glacial Maximum, expressed in the study area as a regional erosional surface [4]. Correlation of sediment facies and seismic data suggest that the proximal parts of the sediment wedge are dominated by coarse-grained facies, evolving seaward to finer-grained sediments. The available age dating in this study suggests that the formation of the outer shelf wedge occurred during the initial part of the postglacial transgression.

We hypothesize about the link between the sediment wedge formation and the timing of MWP-1A.
Some studies suggest that the onset of MWP-1A occurred not earlier than 14.65 ka and lasted about 350 years [1]. Other studies, however, place the onset of MWP-1A closer to 14 ka, with highest rates of sea-level rise at about 13.8 ka [2]. Geomorphological evidences around the world suggest the occurrence of drowned shorelines in relation to a period of sea-level slowdown prior to MWP-1A [3]. Taking into account those global occurrences and the available dating, our initial hypothesis considers the deposits

genesis to have occurred before MWP-1A. The subsequent sea-level rise would cause a significant erosion of the most proximal facies, leaving the more distal prodeltaic facies relatively intact. Additional ongoing age datings will confirm or refute this interpretation.

References:

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