HOLOCENE FINE-GRAINED SEDIMENTS FROM THE BALEARIC ABYSSAL PLAIN

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Abstract

A high resolution sedimentological and geochemical study of Late Holocene sediments in the Balearic Abyssal Plain illustrates the influence of early diagenetic processes and the supply of fine particles escaping from hundreds of kilometres distant continental margins by advective transport.

Keywords : Balearic Abyssal Plain, fine sediment characterization, particle sources, advective transport

Previous studies on Holocene fine sedimentation from the deep Northwestern Mediterranean Sea were carried out on slope and rise environments of the Gulf of Lions, the Catalan and the Balearic margin, most often in relation to canyon / open slope comparative studies [1, 2, 3, 4].

Here we present the results from the analysis of three 30-40 cm in length sediment cores labelled A, B and C, collected in the deep open sea environment of the 2,850 m deep central Balearic Abyssal Plain. The sampling stations occupy the vertices of a triangle that is at the greatest distance from the nearest landmasses, the Balearic Islands to the east and the Corsica / Sardinia block to the west. Accelerator Mass Spectrometry ^{14}C datings show that the upper 30 cm in each of the cores correspond to the last 4,600 years, which implies an averaged accumulation rate of 0,57 cm per 100 years of all cores.

The sediments are yellowish brown and show two 1 cm thick pteropod ooze layers. The upper layer forms the uppermost centimetre in all cores while the lower layer appears 13-14 cm, 19-20 cm and 14-15 cm in cores A, B and C, respectively. The lower pteropod layer represents the base of a graded turbidite lacking of foraminifer tests.

Organic carbon contents (0,19%-0,63%) are low if compared with those from the superficial sediments on the river-influenced Gulf of Lions and Catalan continental margins to the north and northwest of the study area [1, 2]. The C/N ratio oscillates around mean values of 5.7, again lower than the values recorded in the above mentioned margins where C/N>12 [2]. This shows that continental inputs contribute less to sediments than planktonic fluxes in the study area. A remarkable feature has been noticed in the turbidity unit, which upper and lower boundaries show a step in organic carbon contents.

Since biogenic silica contents are considered negligible in the Balearic Basin [5], Si and other geochemically inert elements such as Al and Ti were used as proxies for aeolian terrigenous inputs. The lowest concentrations have been measured at the base of the turbidite while concentrations of these elements were fairly constant in the hemipelagic sections.

The K/(K+Si) index has been used [6] to investigate the origin (fluvial vs aeolian) of the lithogenic fraction. Variations of this index as measured along core C showed minor variations except for the turbidite unit, where a moderate increase was observed. Therefore, terrigenous materials are efficiently transferred to the deepest parts of the basin carried by gravity-driven processes. This viewpoint is further supported by the lutitic terrigenous character of most of the sediment in the Balearic Abyssal Plain as described in the literature [7]. The surrounding continental margins, even if far away from the study area, seem to be the most important source area. This suggests that advection of fine material from river-fed continental margins plays a fundamental role in the formation of the sediments infilling the Balearic Abyssal Plain.

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