Source-to-sink pathways of clay minerals in the Cadiz contourite system over the last 25 kyrs

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The northern continental margin of the Gulf of Cadiz, located between the Iberian Peninsula and Morocco, west of the Strait of Gibraltar, is characterized by a singular continental slope. The middle slope sedimentation is strongly infuenced by along-slope processes driven by the Mediterranean Ouflow Water (MOW). The interaction between the intermediate bottom current from Mediterranea and the seafloor since the early Pliocene generates a complex Contourite Depositional System. For several years, great effort has been devoted to the study of the deposition processes of the middle slope of the Gulf of Cadiz but few studies have focussed on the nature and sources of fine particles over the Contourite Depositional System.

This work presents a detailed sedimentological study of sediment cores collected over the middle slope of the Gulf of Cadiz as part of the Integrated Ocean Drilling Program Expedition 339 and the CADISAR cruise. We performed high-resolution clay mineral and grain-size analyses in order to reconstruct the pathways of fine-grained particles from their sources to their deposition along the contourite depositional system of the Gulf of Cadiz (source-to-sink approach). The clay mineral associations reflect the major contribution of the Guadalquivir River and North African rivers and dusts to fine particles settling over the middle slope. Our results suggest that size segregation deposition processes along the path of the Mediterranean Outflow Water (MOW) are responsible for the contrasted clay mineral associations between sites located under the upper MOW and the lower MOW. We observed drastic changes of sedimentation rates over the contourite depositional system throughout the last 25 kyrs. We assume that these changes are due to temporal variations in the vertical distribution of the upper and the lower MOW whose concentrations in suspended particulate matter are supposed to be drastically different. Sea-level as well as large scale (ITCZ migration) atmospheric changes over this time period induced major variations in the distance of river mouths to the CDS, and in the amount of Northwest African dust delivered to this depositional system, respectively. Climate changes therefore modified fine particle sources and pathways, which considerably influenced clay minerals settling in the middle slope of the Gulf of Cadiz since the Last Glacial Maximum.