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Cold-water corals linked to bottom current strength - examples from the Gulf of Cádiz

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Quite recently, the Gulf of Cádiz was identified to be or at least to have been a settling region for scleractinian cold-water corals. In this context, it constitutes a missing link between the 'coral belt' of the European NE-Atlantic continental margin and cold-water coral ecosystems in the Mediterranean Sea. Observations of recent occurrences of cold-water corals point to a strong relation to vigorous current regimes as corals are preferable found to grow on elevated seafloor structures, where currents are enhanced, and thus, supply food to the filter feeders and simultaneously prevent them from burial with hemipelagic sediments. However, no evidence is given, whether currents are a major driving mechanism or rather belong to a complex pool of forcing conditions, primarily because very few data exist about the effect of changing current regimes on the development of cold-water coral ecosystems. Grain size analyses of three sediment cores collected in the Gulf of Cádiz (Hésperides and Faro mud volcanoes, Renard Ridge) show that coral-bearing sequences within the cores correspond to coarser grain sizes (i.e. stronger bottom currents) of the surrounding sediment, whereas coral-barren zones are associated with finer grain sizes (i.e. weaker bottom currents). Additional information provided by stable oxygen isotope data measured on the same cores, reveals that all coral-bearing sediments as well as the retrieved coral-barren sediments have been deposited under glacial or intermediate climate conditions, but not during interglacials. Taxonomic analyses display distinct temporal changes in the cold-water coral faunal assemblages (mainly composed of Lophelia pertusa and Madrepora oculata), pointing at least to a link between the composition of the coral fauna and climatic changes, as e.g. L. pertusa appears to be more abundant during intermediate climate conditions. Thus, for the first time it has been demonstrated that the presence or absence of cold-water corals largely depends on the local bottom current regime,

whereas overall climatic changes appears to affect the species composition only.