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Particulate matter transport and deposition in the Nazaré Canyon, Portuguese Atlantic margin.

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Observations on suspended particulate matter distribution in the water column, near-bottom current dynamics and particle flux, and accumulation rates of seabed sediments are presented for the Nazaré Canyon, a major submarine canyon on the Portuguese Atlantic margin. Data collected from hydrographic profiling, deployment of benthic landers, and analysis of sediment cores, show that the canyon is an active conduit for the transport of particulate matter from the coastal zone to the deep sea. The upper part of the canyon, stretching from the coastline to the shelf edge where it is incised as much as 2000 m below the adjacent seabed, forms an effective trap for suspended particulate matter and bedload sediments transported by shelf currents. Within the upper canyon the trapped particulate matter is subject to cyclic resuspension, transport and redeposition under influence of tidal currents. Resuspension of sediments is most intense in the canyon head and around 1500 m depth at the lower boundary of the Mediterranean Water mass. A short trap deployment in the upper canyon suggests that particle settling fluxes are on the order of several tens of grams/m2/d. Profiles of excess Pb-210 in bottom sediments indicate sediment accumulation rates on the order of several thousands of grams/m2/y. The transition to the middle part of the canyon is marked by a distinct decrease in turbidity, and clear water is usually found in the middle and lower reaches of the canyon. However, as recorded by a benthic lander in the middle canyon, resuspension of bottom sediments occurs during spring tide peak currents. Settling fluxes appear most of the time much lower than those in the upper canyon, with the exception of a single event recorded in late winter 2003 which resulted in a particle influx of several hundreds of grams/m2. Pb-210 excess profiles indicate very high sediment accumulation rates in this part of the canyon, higher than those in the upper canyon. In the lower Nazaré Canyon, tidal currents recorded by

a benthic lander appeared too weak to cause resuspension of bottom sediments, and particle settling fluxes were on the order of 1 g/m2/d during most of the time. However, a single event in early winter 2004, which we interpret as the passage of a density current, resulted in an influx of particulate matter on the order of several hundreds of grams/m2. The sedimentation events recorded by the landers must have been only minor in comparison to the turbidity currents that left their trace in the geological record. The latter blanketed the lower canyon and adjacent abyssal plain with coarse siliciclastic sand and built up impressive levees of several hundreds of meters height on the sides of the canyon. Preliminary results of analysis of sediment cores from the levees indicate that large turbidity currents were more frequent during glacial sealevel lowstands than during the Holocene period of high sealevel.

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