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Modern sedimentation associated with the Murray Canyons system offshore southern Australia

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The Australian continental margin is the host of numerous canyons, most of which are poorly known. The most spectacular canyons are located offshore Kangaroo Island, and these appear to be linked to ancient courses of the River Murray which would have been flowed across the shelf during periods of low sea. At the difference of European canyons, which usually indent the coastline, this canyon system is far away from the coastline and may present a different dynamic of particle supply. Fluvial inputs are likely negligible due to sea level rise and dam building during the last century. In addition, the shelf in this area is wide, up to 200 km. Canyons are usually presented as natural conduits for the transfer of particulate matter from the shelf to the deep ocean. But, considering their peculiar characteristics of (absence of fluvial supply, long distance from the Australian mainland), one could address the question if the Murray canyons system could be, in the manner, an active locus for sediment transport and deposition at present. Therefore the objective of this work was to characterize sediment transport and deposition within these canyons on seasonal to century timescales using a multi-tracer approach. The Auscan-1 project (MD131, r/v Marion Dufresne, February-March 2003) has permitted a first investigation of this system. Interface sediments were collected betwen 350 and 2500 m water depth, using a multicorer in order to recover a well-preserved water-sediment interface. Activities of Pb-210 and Th-234 were measured by non-destructive low-background-high efficiency gamma spectrometry; activities of Th-230 by alpha spectrometry after acid digestion of sediment. Th-234 in excess was always detected at significant levels in surface samples. With its short half-live (24.1 days), this observation shows the presence of freshly deposited particles. Bioturbation rates derived from Th-234 profiles

(0.2 - 2 cmˆ2 per year) decrease with depth as observed on the N-W Australia margin. They are higher than those reported for the Nazare canyon by example, and may indicate significant organic inputs at the water-sediment, in agreement with the observation of abundant faecal pellets. Sedimentation rates based on Pb-210 (0.03 - 0.13 cm par year) present the same decreasing trend with depth. Focusing ratios, as calculated by the ratio of the expected flux of Th-230 from the overlying water column to the down-core determinations of decay-corrected unsupported Th-230, support the occurrence of significant horizontal advection of sediments within the canyon. Both tracers agree to describe the upper part of Murray canyons system as an active locus for sedimentation. In the absence of riverine inputs, the shelf, place of an intensive production, may supply organic material. In conclusion, the Murray canyons system is likely to play a significant role in the exchange of material between the shelf and the deep ocean.