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Twilight zone C mineralization under different regimes of macro- and micronutrient availabilities in the Southern Ocean

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In the interdisciplinary network BELCANTO III project (integrated study of the Southern Ocean Biogeochemistry and Climate interactions in the Anthropocene, funded by BELSPO, Belgian Science Policy) specific attempts are made to determine the export magnitude and the fate of sinking biogenic materials via a multi-proxy approach, including Ba-barite, ^{234}Th-deficit, bacterial activity, new-production, biomarkers. Earlier work has shown that among these proxies, particulate biogenic Ba in excess of lithogenic Ba (Ba_{xs}) is a powerful proxy of organic carbon mineralization in the mesopelagic or twilight zone (100-1000 m). During the SAZ-SENSE cruise (Jan.-Feb. 2007) in the Australian sector of the Southern Ocean we studied these different proxies under contrasting regimes of nutrient availability and ecosystem functioning. Baxs profiles between the Polar Front Zone PFZ and the SubTropical Zone STZ eastward of the Tasmanian plateau display the typical maximum at mesopelagic depths, as observed during earlier expeditions. We observed that this Baxs maximum shoals in north-east ward direction between the PFZ and the STZ, following a decrease in the thickness of the upper mixed layer, thus reflecting a close linkage between the location of the twilight zone Baxs signal and the source region from which organic ma-

terial is exported. We also observed that twilight zone Baxs inventories correlate with the fraction of column integrated (i.e. upper 1000m) bacterial production occurring in the water column underneath the mixed layer, highlighting the linkage between the occurrence of mesopelagic Baxs and bacterial activity. Organic carbon mineralization fluxes estimated from the Baxs inventories range between 34 to 80 mgC/m2/d. These results are compared with primary production and f ratio (from ^{13}C, ^{15}N uptake experiments), carbon export production (from ^{234}Th deficit) and bacterial carbon demand, with the aim to gain insight in the fate of exported material and the existing deep ocean carbon sequestration potential of the studied area.