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# Mesopelagic C mineralization at the Southern Ocean's scale

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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 fate of exported sinking biogenic materials following bloom development via a multi-proxies approach including Ba-barite, f-ratio, $^{234}$Th, bacterial activity, $\delta^{15}$N, biomarkers and $\delta^{30}$Si. Among these proxies, the particulate biogenic Ba in excess ($Ba_{xs}$) was shown to be a powerful proxy of C mineralization processes in the mesopelagic zone (100-1000 m). The fate of the exported C is not only dependant on the magnitude of the export but also is significantly modified by conditions at intermediate layers. We highlighted that the mineralization process in response to bloom development can be variable: systems where calcium carbonate producing plankton is significant (mainly north of Polar Front) are prone to more important deep export than systems dominated by diatoms characterized by more intense mineralization in upper mesopelagic layers. Moreover, in diatom dominated systems thriving in Fe replete conditions blooms are less prone to mesopelagic C mineralization when surface productivity is particularly intense and when the materials exported are composed by larger diatoms and fast sinking pellets. On the contrary, mesopelagic processing of organic matter appears higher in HNLC systems dominated by smaller diatoms, lower grazing pressure and bacterial activity extending deeper in the water column. At the

Southern Ocean scale, mesopelagic C mineralization as deduced from particulate barium stocks is particularly intense in the Subantarctic and Polar Front Zones, coinciding with regions of atmospheric $CO_2$ sink. Only a systematic comparison of these mineralization fluxes with the C export from the surface mixed layer will allow determining which areas have potential for deeper C sequestration.