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Biogeochemical functioning of shallow seafloor communities in South Bay (Doumer Island, western Antarctic Peninsula)

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Shallow seafloor ecosystems are considered hotspots for carbon cycling and biodiversity within the global ocean. However, little is known about the shallow habitats around Antarctica due to 1) the sites remoteness and 2) the technical challenges associated with the quantification of benthic metabolism from complex cold-water communities. Using the non-invasive Aquatic Eddy Co-variance (AEC) technique we performed an extensive survey of the shallow areas (<70 m depth) of South Bay on Doumer Island (Palmer Archipelago, western Antarctic Peninsula) during the Austral summer (January-February 2017). With the *in situ* AEC approach, we were able to quantify benthic dissolved oxygen (O_2) fluxes across different benthic substrates including rocky habitats, where traditional flux measurement approaches are compromised.

The shallowest sites (17-22 m depth) were dominated by primary producers (macroalgae and encrusting corallines) with AEC-based oxygen fluxes documenting a significant O_2 release of up to ~6 mmol m^{-2} h^{-1} during daytime, and an O_2 uptake of comparable magnitude during the night. Deeper sites (30-40 m depth) were characterized by the occurrence of both macroalgae and small to large epifauna (e.g., sponges, bivalves) and showed similar O_2 flux dynamics but with dampened net primary production. The deepest sites (50-65 m depth) were dominated by large epifaunal communities and the associated O_2 fluxes showed a constant O_2 uptake with no apparent diel variation. Data are used to investigate the variability of benthic metabolism across a depth gradient of different seafloor communities, ranging from primary producer to large epifaunal-dominated communities. The potential of using parallel mapping of biodiversity for upscaling the data to regional carbon turnover is discussed.