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Dissolved organic matter (DOM) dynamics in Marian Cove, Antarctica: Insights from total dissolved amino acids and fluorescence DOM

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To characterize and quantify the dissolved organic matter (DOM) pool in Marian Cove, Western Antarctic Peninsula, spatial distributions of total dissolved amino acids (TDAA) and fluorescence DOM (FDOM) were analyzed. TDAA concentrations in bottom waters (124.1 ± 72.9 nM) were about three times higher than in surface waters (47.6 ± 19.9 nM). Given the low phytoplankton productivity (0.18–0.48 g C m^{-2} day^{-1}) during study period, primary production appeared to be an insufficient source of DOM. Instead, the presence of highly bioavailable DOM in bottom waters was evidenced by the similarity in carbon- and nitrogen-normalized yields and TDAA-based indices, including the degradation index (DI) and reactivity index (RI). This bioavailability was likely influenced by inputs from Maxwell Bay, or may have originated from benthic diatom productivity, as Marian Cove is known for its relatively high benthic biomass. Furthermore, the elevated molar percentages of bacteria-derived D-amino acid in bottom waters indicate enhanced microbial activity driven by the input of labile substrates. The predominance of the marine humic-like component and the optical humification index (HIX) further support the biodegradation of DOM, as identified by TDAA. These results suggest that small, glacial-retreated fjords like Marian Cove are particularly susceptible to external organic matter inputs, leading to more pronounced variations in microbial responses and biogeochemical cycling in Antarctic coastal environments. Additionally, DOM dynamics observed in bottom waters indicate a decoupling between benthic and pelagic organic matter processes, with microbial activity appearing more active in the benthic system.