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Responses of Southern Ocean benthic primary producers to ocean acidification: Antarctic application of Free Ocean Carbon Enrichment (FOCE) technology.

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Ocean acidification (OA) is the change in carbonate chemistry of the oceans due to CO₂ absorption from the atmosphere, resulting in a reduction in oceanic pH. It is predicted that by the year 2100 marine communities will be exposed to a pH 170% more acidic than current conditions. This is expected to alter marine community structure and functioning. However there is a paucity of information on community level responses to ocean acidification in the Southern Ocean and especially on benthic ecosystems. Furthermore the majority of information about OA impacts we have is on single species experiments in laboratory conditions which lack natural ecological interactions. Primary producers like microalgae are critically important for benthic Antarctic ecosystem and can comprise of hundreds of different species. It is essential that we have an accurate understanding of how primary producers will respond to Climate Change in-situ at a community level that incorporates all natural ecological interactions. Free Ocean Carbon Enrichment (FOCE) experiments are a recent advancement in technology which enables in-situ community level experiments. We conducted the first benthic polar FOCE experiment (antFOCE) and have analysed the effects on benthic microalgae community composition via High Performance Liquid Chromatography (HPLC). We found ocean acidification conditions had a minimal effect on community composition of primary producers, with some microalgae species showing positive responses to OA. Our results demonstrate the importance of FOCE experiments to achieve an accurate understanding of how microalgae communities will respond to OA.