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Is water stratification affecting the production/export dynamics of the coastal areas in the Western Antarctic Peninsula?

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Normally the Southern Ocean is characterized by its High Nutrient availability and its Low Chlorophyll concentrations (HNLC). Discrepancy, which seems to be caused by the paucity of micronutrients (e.g. iron). Nevertheless, this general pattern does not entirely apply in coastal areas (e.g. bays), where iron is more abundant due to meteoric water inputs (i.e. glacial melt). In the Western Antarctic Peninsula (WAP) water column stability has been proposed as the main driver of primary production.

During the spring of 2016 sea-ice cover reached its historical minimum since scientists keep records. This situation probably drove the warmer sea temperatures that we registered inside two WAP bays during summer of 2017 (January and February). Warm sea surface temperature (SST) promoted a more stratified water column, triggering massive phytoplankton blooms inside Maxwell Bay (King George Island, South Shetland Islands; SST > 2 ˚C, chlorophyll > 25 mg m-3) and South Bay (Doumer Island, Palmer Archipelago; SST > 3 ˚C, chlorophyll > 15 mg m-3). These phytoplankton blooms were mainly composed of large cells (> 20 microns), whereas Salpa thompsoni dominated zooplankton. Periods of fast winds (>70 km h-1) mixed the water column, breaking the stratification that had promoted phytoplankton blooms. Then, chlorophyll started to diminish, whereas its downward vertical flux increased from 2.6 to 7.5 (g m-2 d-1). Despite the differences between the two bays (e.g. location, orientation), we recorded similar patterns in both of them, suggesting that this may be a common feature for WAP coastal areas and, perhaps, the whole Southern Ocean. During future summer expeditions (January - February 2018), we will be able to analyze if enhance primary production/growth rates are a phytoplankton response to warmer SST or is a common summer feature for Southern Ocean coastal waters.