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Tuesday, October 9
Poster Session 2
10:30–12:30

Poster 209

TOWARDS LARGE-SCALE ESTIMATES OF PHOTOSYNTHETIC COMPETENCY: AN ASSESSMENT OF IRON STRESS AND OTHER ENVIRONMENTAL FACTORS ON NON-PHOTOCHEMICAL QUENCHING IN NATURAL PHYTOPLANKTON COMMUNITIES

The synoptic assessment of phytoplankton photosynthetic competency over large temporal and spatial scales is a crucial requirement for improved estimates of oceanic primary productivity. The quantum yield of chlorophyll fluorescence, which can be estimated from space, is currently the only direct measure reflecting the physiological state of phytoplankton on large scales. However, quantitative interpretation of the fluorescence quantum yield is hampered by a lack of understanding of the drivers of non-photochemical quenching (NPQ). NPQ is caused by an upregulation of heat dissipation of excess absorbed light energy in the antennae of photosystem II at high light, and it serves to protect the photosynthetic apparatus of the phytoplankton. While sensitivity of NPQ to the light acclimation state of phytoplankton has been demonstrated, other drivers of NPQ, including Fe status and species composition, remain to be examined. During a recent research voyage in the Southern Ocean, we conducted 4 short-term (~48h) deck incubation experiments to investigate the relationship between NPQ and iron limitation, probing NPQ with rapid light curves measured by fast repetition rate fluorometry (FRRF). HPLC samples were taken to elucidate the community composition in the respective incubations. The high-light results indicate increased NPQ in iron-stressed phytoplankton. Rapid light curves were also measured on natural phytoplankton assemblages in order to compare NPQ as estimated with an FRRF to an apparent quantum yield of phytoplankton fluorescence. The latter was derived from underway fluorescence, photosynthetically active radiation, and chlorophyll-a estimates based on the absorption line height at 683 nm, measured with an ac-9.

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