Wednesday, October 10
Poster Session 3
16:00–18:00

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Poster 7

PREDICTION OF PHOTO-PROTECTIVE CAROTENOIDS AT GLOBAL SCALE

As phytoplankton cells are exposed to natural dynamic light fields, they develop various combined mechanisms in order to optimize their light harvesting and photosynthetic electron transport. Especially under high light conditions algal cells evolve various physiological protective mechanisms to dispose excess light energy to prevent damage of the photosynthetic apparatus. Among these mechanisms the so-called xanthophyll cycle (XC) is one of the most important one, which avoids overexcitation of the photosynthetic systems by thermal dissipation of the excess energy. In response to high light phytoplankton cells accumulate XC-pigments to avoid the photodamage, which would cause photoinhibition. The mechanistic model for photoinhibition proposed by (Marshall, Geider & Flynn 2000) predicts how changes in light, nutrients and temperature influence the parameters of the photosynthesis-irradiance relationship. The model does not parameterize a variable XC-pigments pool size, hence, it predicts the changes in light absorption parameters that would take place with a constant XC-pigments pool. We inserted this model in the global biogeochemical model REcoM2 to predict the photo-protective needs of phytoplankton in terms of the XC-pigments pool size. Two global scale databases of HPLC pigments showed how the predicted photoprotective response correlates with photo-protective carotenoids pool at global scale, with the advantage that the model prediction is separable per phytoplankton group. Our results show higher concentration of XC-pigments in lower latitudes being non-diatom phytoplankton the main contributor. XC-pigments pool size and its relation to photosynthetic pigments are relevant when describing the light harvesting by phytoplankton at the global scale.

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