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Picoplankton rocks: changes in EPS production during an artificial cyanobacterial bloom and possible implications for initiation of whiting events

MS. MARLISA MARTINHO MARTINHO DE BRITO, PHD[1], IRINA BUNDELEVA[2], FRÉDÉRIC MARIN[2], ANNICK WILMOTTE[3], EMMANUELLE VENNIN[2], LAURENT PLASSERAUD[2] AND PIETER T VISSCHER[4]

[1]Universite de Bourgogne Franche-Comté
[2]University of Bourgogne Franche-Comté
[3]University of Liège
[4]The University of Connecticut

Presenting Author: marlisabrito5@gmail.com

Cyanobacterial blooms, e.g., of *Synechococcus* spp., make a key contribution to global primary productivity. Blooms can increase water pH to > 9 and as high as 11. During the photosynthetic activity, cells enhance the production of extracellular polymeric substances (EPS) that can bind cations, such as Ca^{2+}. Environmental conditions can affect the quantity and composition of EPS (*e.g.* pH), impacting the Ca-binding capacity and influencing the properties of $CaCO_3$ minerals. Thus, EPS properties are expected to change in prolonged cyanobacterial blooms.

Cyanobacterial blooms have been associated with extensive calcium carbonate precipitation events (e.g. whitings) in both marine and freshwater environments. Whitings are episodic precipitation events of fine-grain calcium carbonates in the water column. These naturally-occurring phenomena represent a potential mechanism for CO_2 sequestration ($2HCO_3^- + Ca^{2+} = CaCO_3 + H_2O + CO_2$). Several biogenic scenarios have been proposed to explain these events, but the role of EPS was so far overlooked.

In this study, we investigated the properties of EPS during 56 days of *Synechococcus* growth and correlated the observations to the natural blooms. We propose an EPS-supported carbonate precipitation mechanism to explain the origin of whiting events.