

Interactive comment on “New observations of the distribution, morphology, and dissolution dynamics of cryogenic gypsum in the Arctic Ocean” by Jutta E. Wollenburg et al.

Anonymous Referee #2

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This is an excellently executed investigation on a subject that long has been around in the vertical flux literature. It is clearly and well written. I am not a chemical oceanographer and can thus not evaluate most of the chemical analyses. However, the description of the morphology, size, dissolution and sinking velocity of cryogenic gypsum particles is a major break-through for vertical flux regulation in ice-covered waters.

When it comes to the regulation of vertical export of biogenic particles in the Arctic Ocean, in particular the sinking and non-sinking of phytoplankton and ice algae this manuscript provides mechanisms that are of great interest. I would have liked to see some speculation in this direction. To the candidates that have been discussed

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previously belong *Phaeocystis* with sinks (1, 2) or does not (3). Similar speculations also exist for *Melosira arctica*. The authors may have the mechanism to understand the pelagic-benthic coupling in the Arctic Ocean in their hands. This deserves some high-thinking. How will for example warming of surface waters below sea ice impact the sinking of biogenic matter and bloom development in the future?

(1) Wassmann, P., Vernet, M., Mitchell, G., Rey, P. (1990). Mass sedimentation of *Phaeocystis pouchetii* in the Barents Sea during spring. *Mar. Ecol. Prog. Ser.* 66: 183-195.

(2) Hamm, C., M. Reigstad, C. Wexels Riser, A. Mühlebach & P. Wassmann (2001). On the trophic fate of *Phaeocystis pouchetii*: VII. Sedimentation of *Phaeocystis*-derived organic matter via krill fecal strings during a *Phaeocystis* bloom in the Balsfjord, northern Norway. *Mar. Ecol. Prog. Ser.* 209: 55-69.

(3) Reigstad, M., Wassmann, P. (2007). Does *Phaeocystis* spp. contribute significantly to vertical export of biogenic matter? *Biogeochemistry* 83 (1-3): 217-234

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