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The Ultimate Breakdown Beneath the Surface
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Zooplankton Influence on C, N and P Degradation in Diatom Aggregates

In the ocean, carbon export is driven by the biological carbon pump where organic matter is transported from the surface layer to the deep sea. The sinking particulate organic matter is mainly a product of algae clumps (aggregates) and faecal pellets from zooplankton & fish, together also known as "marine snow". Marine snow is continuously being degraded by microbial and zooplankton activities as it sinks to the depth. Zooplankton are important organisms in the bottom of the marine food web. They actively effect how much carbon is being transported to the deep sea.

I was investigating the degradation of aggregates made by two algae species (*Skeletonema marinoi* and *Chaetoceros affinis*) with and without the presence of copepods by measuring their carbon, nitrogen and phosphorus content over a two-week period. I further measured their sinking speed by making video recordings. In the end I used the data in a model to illustrate the global export of carbon in the ocean.

In this study I found that aggregates are being fragmented by copepods making the aggregates smaller, which alters their sinking speed. I was also able to detect that the aggregates formed by *Skeletonema marinoi* sink faster than the aggregates formed by *Chaetoceros affinis*. This is most likely due to the fluffier structure of the *Chaetoceros affinis* aggregates what slowed the sinking process down. I detected a decrease in carbon, nitrogen and phosphorus content in the aggregates over the two-week period, an indicator for a degradation of the aggregates. However, we expected to see a faster remineralization of nitrogen and phosphorus due to their importance in metabolism and growth in copepods. We were unable to show that, and, in the future, we would try to use a longer experimental duration in order to enhance the probability to proof our hypothesis.

Nevertheless, we were able to use our data in a model and illustrate the carbon export in three different parts of the ocean. This model predicted an export of carbon of 4 000 to 14 000 g carbon per meter, depending where in the ocean carbon is being exported. In our predictions the carbon could stay in the deep sea for up to 31 years, before it recycles back up to the surface.

The more carbon is being exported in the ocean and stored in the deep ocean the better, as it helps remove CO_2 from the atmosphere. CO_2 is increasing due to climate change, and the ocean is one important storage place for it. Understanding the factors that influence the export of carbon in the ocean, helps making models better in calculating the efficiency at which carbon can be exported and stored in the ocean. This will help making better assumptions for the future and it will help us take actions in fighting climate change.

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