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Experimental evidence of dust-induced shaping of surface dissolved organic matter in the oligotrophic ocean

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Recent research has shown that dust deposition may impact the functioning of the microbial loop. On one hand, it enhances bacterial mineralization of dissolved organic matter (DOM), and so may limit the carbon export. On the other hand, the interaction between heterotrophic bacteria and DOM in the surface ocean can increase the residence time of DOM, promoting its export and sequestration in the deep ocean. The main goal of this study was to experimentally assess whether the bacterial response to dust deposition is prone to have an effect on the residence time of the DOM pool by modifying its bioavailability. The bacterial degradation of DOM was followed on dust-amended and control treatments during long-term incubations. Dissolved organic carbon concentration decreased by 9 μmol L-1 over the course of the experiment in both control and dust-enriched conditions, with no significant differences between treatments. However, significant differences in DOM optical properties appeared at the latest stage of the incubations suggesting an accumulation of DOM of high molecular weight in the dust-amended treatment. At the end of the incubations, the remaining water was filtered and re-used as a new culture medium for a bacterial natural assemblage. Bacterial abundance and production was lower in the treatment previously submitted to dust enrichment, suggesting a decrease in DOM lability after a dust deposition event. These preliminary results point to a new link between dust and ocean carbon cycle through the modification of the residence time of the DOM pool.