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## Transparent exopolymer particles (TEP) in the tropical oligotrophic Atlantic Ocean: Sea-to-air transfer and atmospheric in situ formation

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Transparent exopolymer particles (TEP) exhibit the properties of gels and are ubiquitously found in the world oceans. Here we demonstrate that TEP may enter the atmosphere as part of sea spray aerosol and likely influence cloud properties. We show number concentrations of TEP with a diameter > 4.5  $\mu\text{m}$ , hence covering a part of the supermicron particle range measured in ambient aerosol and cloud water samples from the tropical Atlantic Ocean. Furthermore, TEP were analysed in generated aerosol particles using a plunging waterfall tank that was filled with the ambient seawater.

Based on  $\text{Na}^+$  concentrations in seawater and the atmosphere, the enrichment of TEP in the tank generated aerosol particles was well in-line with another study. The TEP enrichments in the ambient atmosphere were, however, up to two orders of magnitude higher compared to the tank study and such high values are thus far not reported for supermicron aerosol particles. We propose that the high enrichment of TEP in the particles and in cloud water result from a combination of enrichment during bubble-bursting transfer from the ocean and secondary in-situ atmospheric formation. We suggest that similar (biotic and abiotic) formation mechanism reported for TEP formation in the (sea)water might take place in the atmosphere as well, as the required conditions (e.g. high concentrations of dissolved TEP precursors such as polysaccharides, presence of bacteria in the cloud water) were given.

TEP concentrations in the atmosphere were two orders of magnitude higher than INP concentrations in the aerosol particles and cloud water, respectively. However, only a part of the TEP population, assumingly the one colonized by bacteria, might contribute to INP population, and are worth further studies.

The study contributes to the international SOLAS program.

Ref. : van Pinxteren, M., Robinson, T.-B., Zeppenfeld, S., Gong, X., Bahlmann, E., Fomba, K. W., Triesch, N., Stratmann, F., Wurl, O., Engel, A., Wex, H., and Herrmann, H.: High number concentrations of transparent exopolymer particles in ambient aerosol particles and cloud water – a case study at the tropical Atlantic Ocean, *Atmos. Chem. Phys.*, 22, 5725–5742, <https://doi.org/10.5194/acp-22-5725-2022>, 2022.