Backtracking nanoplastics found in the abyssal South Atlantic using Lagrangian simulations with fragmentation

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Abstract

During an expedition in January 2020 nanoplastics were sampled at a depth of -5170m over Cape Basin, in the South Atlantic Ocean. After laboratory analysis, it was identified that these were polyethylene terephthalate (PET) particles with an approximate diameter of 50 nm, all of them at different states of degradation. By using a state-of-the-art Lagrangian 3D model, that includes fragmentation, we backtracked virtual particles to study what is the origin of the PET nanoplastics sampled at this location. We found that fragmentation plays a significant role in determining the origin of these particles. In particular, we found that it is very unlikely that the nanoplastic particles entered the ocean in the state in which they were sampled (without experiencing any fragmentation). We also found that the fragmentation scheme, and in particular the fragmentation timescale prescribed to the modeled particles, affect the way in which they drift in the ocean, by controlling the time they drift at different depths. This study contributes to understanding the fate and origin of nanoplastics found in the deep ocean.

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