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Understanding the plastic cocktail using distributions

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Plastic pollution proves a complex challenge, given the large variety in the properties of the items and particles. Usually, models and experiments focus on a small, sometimes arbitrary, subset of the total plastic continuum. This inherently implies a limitation, and will never be fully satisfactory if we are to understand the true behavior of plastic of all sizes, shapes and densities in the environment. Here, we present a novel approach, in which plastics are fully characterized by continuous distribution functions. For microplastics, we report and discuss distributions obtained for the marine and freshwater environment, from water and sediment samples. For macroplastics, we report spatial and temporal trends based on distributions that were derived from monitoring data from the OSPAR beach litter program. We discuss how these micro- and macroplastic distributions can feed directly into transport and fate models. Additionally, they can be used to design effect and fate experiments, where mixtures of (environmental) plastic should be used to better represent the real, complex mixture that plastic really is. By using this approach, the often acclaimed problem of complexity as a limiting factor is circumvented, which brings a true understanding of plastic fate and effects within reach.