Microplastic aggregation and transfer in marine systems (MOTION): Research project presentation

Liliya Khatmullina[1], Elena Gorokhova[2], Irina Chubarenko[1]
1 : Shirshov Institute of Oceanology, Russian Academy of Sciences, Russia
2 : Department of Environmental Science, Stockholm University, Sweden
liliakhatmullina@gmail.com, elena.gorokhova@aces.su.se, irina_chubarenko@mail.ru

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Si. Svenska institutet

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Interactions with various suspended soils and natural colloids are important but poorly understood aspects of microplastic (MP) behavior in aquatic environments. The result of these interactions is the formation of aggregates, where MP are incorporated together with live and dead organics, so-called marine snows. The vertical transport of organic substances, including living cells, represents an essential part of the carbon pump exporting organic matter from the photic zone to the deep ocean. Plastic particles have been found in marine snow along the water column as well as in sediments, implying that sinking aggregates could be an efficient export mechanism of MP to the deep ocean. However, it is unclear whether the sinking rate and the associated carbon pump processes can be affected by MP at the ecologically relevant abundances of the plastic litter. In MOTION project, we focus on reviewing interactions between MP and other particles ubiquitously present in pelagia and analyze the kinetics of the aggregate formation, their settling characteristics, and the role of microorganisms in the aggregation.

#MOTIONproject: link.growkudos.com/1jr11c2yr5s
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Suspended and settling particles in the water column, an estuary example

Particles of different nature present in the water column comprise a complex system driven by environmental factors and interactions between its components

	Size, m	Counts, #/liter	Settling rates, m/day
Microplastics	$10^{-5} – 10^{-3}$	**10^{-3} to 10s** e.g. LITTERBASE	**0 to 10^{4}** Khatmullina, Isachenko, 2017
Nanoplastics Mattsson et al., 2018	$10^{-9/-7}$	**<1 to 10^{9}** Gallego-Urrea et al., 2010	
Algae	$10^{-6} – 10^{-4}$	**<10 to 10^{9}** (blooms)	**0 to 10^{2}** (depending on aggregation) e.g. Turner, 2002; Passow, 1991
Bacteria Sommer et al., 2000	10^{-6}	**<10 to 10^{12}** (blooms) e.g. Bunse et al., 2016	
Suspended particulate matter (inorganic) Puls et al., 1997	10^{-6}	**10^{6} to 10^{7}** Sivkov, 1994	**1 to 10s** Whitehouse et al., 1958
Transparent exopolymer particles Turner, 2015	10^{-6}	**10^{7} to 10^{8}** Engel et al., 2002	↑ **10^{-1}** Azetsu-Scott, Passow, 2004
Marine snow Turner, 2002	$10^{-3} – 10^{-2}$	**<1 to 10^{2}** e.g. Shanks, 2002; Moeller et al., 2012	**<10 to 10^{2}** Shanks, 2002; Turner, 2015
Fecal pellets Iversen and Ploug, 2010	10^{-4} - 10^{-3}	**1 – 3** e.g. Viitasalo et al., 1999	**10 to 10^{2}** Viitasalo et al., 1999

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