

Interactive comment on “Physical transport properties of marine microplastic pollution” by A. Ballent et al.

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The topic of how microplastic pollution is dispersed in the sea is certainly worthwhile, and in particular investigating the route by which these plastics might reach the open ocean or the deep seabed. It is also true that there is a dearth of data on the distribution of different plastics in the marine environment, though a few high-profile publications on plastics reaching some of the most remote regions of the ocean.

However, this manuscript partially addresses 3 separate areas of the problem and pulls them together into a manuscript that is not convincing.

1. The section dealing with plastic sampling along strandlines is very weak. The only justification for it seems to be "to contribute to the growing worldwide data collection".

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While such additional data is commendable, there is very little here that really tells us anything substantial about the coastal source of plastics. There is no sense of a hypothesis being investigated, or of any real quantitative results arising from it. Without this the sampling looks somewhat arbitrary.

2. The choice of modelling microplastic behaviour around a canyon is really interesting, as that's what we might think of as a conduit for coastal and shelf material to the open, deep ocean. The description of the model is cursory. While citations are provided, there does need to be some details here on model configuration, e.g. grid size, vertical resolution, time step, treatment of horizontal dispersion, how the particles were tracked. The experiments carried out and described are very limited. Export of material down canyons DOES happen, though the manuscript seems to suggest that it isn't important. There is a considerable body of evidence for the Nazare Canyon (e.g. the Deep Sea Research special issue from which the Mordecai et al paper is cited) showing how particulate carbon can be exported down the canyon to support slope benthic ecosystems. Importantly, these down-canyon flows are episodic, and are often associated with dense water cascades off the shelf in winter. The model experiments presented seem to just have tidal forcing in them (so not much chance of episodic events) and do not cover the winter period when such cascades might be more likely. The description of the model results lacks detail and broader physical context. The minimal displacements of particles in the model (40 metres?) will give an incorrect view of how particles are exported down canyons.

Having said all that, on its own and expanded with better, more extensive model experiments, this could be a neat piece of work. The supporting lab work to determine the densities of typical microplastics is strong.

3. The lab work on the behaviour of different types of plastic in turbulent environments has a lot of potential, though as it stands it again lacks a clear hypothesis and reason for the investigation. There was a good attempt to quantify what is almost unavoidably a qualitative experiment.

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Overall, there is potential in this work but the attempt to describe what appear to be 3 very separate and limited pieces of work into 1 paper is unsatisfactory. My suggestion would be to separate the canyon work and do a much more thorough job on setting up experiments to investigate the potential for episodic plastic transport events which could well have a seasonal variability. It could also be very useful to link the standline work (albeit with more extensive sampling with some stronger statistical basis) with the turbulence/lab work in an investigation of the fate of different types of plastic in a turbulent coastal zone.

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