

Ocean Sci. Discuss., referee comment RC3  
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## **Comment on os-2021-83**

Anonymous Referee #3

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Referee comment on "Using machine learning and beach cleanup data to explain litter quantities along the Dutch North Sea coast" by Mikael L. A. Kaandorp et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-83-RC3>, 2021

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Review of „Using machine learning and beach cleanup data to explain litter quantities along the Dutch North Sea coast”, by Mikael L. A. Kaandorp et al.

### **Summary and scientific relevance:**

The purpose of this manuscript is to investigate the physical processes leading to the accumulation of litter on the beaches of the Dutch North Sea coast. Data from six years of beach cleanups were used to fit a variety of environmental parameters with a random forest model to identify possible correlating variables affecting litter accumulation on the coast. Tidal height and variability were found to be the strongest explanatory variables, leading to a decrease in litter accumulation at the coast with increasing tidal height and variability. In addition, shoreline geometry was found to have explanatory power for litter accumulation on Dutch beaches. Based on the best explanatory variables, the authors extrapolated the distribution and abundance of beached litter on the Dutch North Sea coast, which may contribute to effective cleanup strategies by identifying hotspots of litter accumulation along the coast.

### **General comments:**

The manuscript is well organized and generally easy to follow. The presentation of data and methods is very well structured and the results are clearly illustrated. The method presented for studying coastal litter accumulation is very innovative and can help provide valuable insights into the processes governing the beaching of marine litter in shelf seas. I wonder about two points that I think are particularly important for coastal shelf seas. I would like to recommend this manuscript for publication after moderate revision according to the following points.

- As far as I understand it correctly, the authors of this study used the AMM7 model of the Copernicus Marine Service for the advection of the virtual particles. One key point I wonder about is how the authors analyzed the influence of tides on marine litter washing ashore on Dutch beaches. The authors found that tidal height is the most important influencing variable, resulting in a decrease in the amount of litter as the variability and height of the tides increases. Numerical studies (e.g., Stanev and Ricker, 2020) and observational studies (e.g., Meyerjürgens et al., 2020) have found that tidal forces (including overtidies) have a significant influence on the length of Lagrangian trajectories and particle residence times, in addition to affecting particle dispersion at different spatial scales. Since the authors used daily average values of ocean current fields, the effect of tides is suppressed in the analyzed Lagrangian model, which is very important for the reader to classify the results of this study. Please clarify and discuss the important effects of tidal currents on the results of this study.
- Another point I wonder about is why the authors of the study use anthropogenic variables such as fishing intensity as possible sources (for the Lagrangian model), but do not include anthropogenic factors (other than population density) in the statistical analysis. I would recommend that the authors include anthropogenic parameters such as "ship density" and "fishing activities" (which can be taken from EMODNET, for example) as possible explanatory variables in their analysis to get a sense of how anthropogenic factors affect coastal litter accumulation compared to hydrodynamic and atmospheric parameters.

**Specific comments:**

Line 110: The authors have considered the most important tidal components in their calculations. In the North Sea, shallow-water tides (M6 and M4) play an important role in the currents and advection of particles. Please keep this in mind in your analysis and consider it when discussing your results.

Line 143-144: Unclear to me. Please rephrase this.

Line 174-175: I can't see a dashed brown line in Fig. 3a. Do you mean the brown arrow in this context?

Line 213: Please clarify why  $U_{\text{tide}}$  is not considered as a scalar feature.

Line 344: This sentence seems incomplete.

Line 352: Where does this grid size come from? AMM7 should have a resolution of 7 km x 7 km. Perhaps it arises from the inclusion of lower resolution Stokes drift data in the numerical grid? This is not clear to me. Please clarify and add a section in Section 3.1.1 on how your grid size is defined by merging the different data sources.

**Technical corrections:**

Line 13: ... the Dutch coastline.

Line 15: ... the need for...

Line 75: ...end of the stage...

Line 76: Most litter found... or Most of the litter found...

Line 152: ... on how...

Line 184: ...that are...

Line 218: ...are calculated...

Line 225: ... is used...

Line 227: ... is available.

Line 236: ...from the coastal population.

Line 323: "not to have" not well formulated, please rephrase.

Line 363: ... coastline into...

Line 381: ...play an important role...

Line 386: ...is seen...

Line 08: ...the importance...

Line 420: ... can be taken into account....