Review of ' Using machine learning and beach cleanup data to explain litter quantities along the Dutch North Sea coast ' by Kaandorp et al.

I have read the responses of the authors and the revised manuscript, and find it significantly improved. I have mostly minor suggestions (see below), except for one point that may require some further work:

We would like to thank the reviewer for going through our manuscript once again, and for this positive feedback.

The authors have used a range of lead times in the scenario simulations, with a maximum of 30 days. Yet, obviously, such a time period is too short for litter released further away to reach the area of interest. Also, the most important factor identified (Figure 5) has a lead time of 30 days. This suggests that longer lead times may (also) be important, or possibly even more important. I would suggest additional simulations, with progressively longer lead times, until increasing the lead time does not add additional cases to, say, the top 10?

We understand where this comment comes from, but want to highlight that additional simulations are not necessary because of several reasons:

- Firstly, and most importantly, there is in fact information in the model on litter from further away reaching our area of interest. In the Lagrangian model runs, particles are released at locations around the European shelf where we expect litter to enter the sea. These particles are tracked for at least 2 years. To be more specific, we looked at the maximum beaching time scale ($\tau_{beach} = 150\ days$), and advect the particles until they have lost more than 99% of their original mass due to the beaching process (which is after spending 691 days next to the coast, or 1.9 years). We acknowledge that this was perhaps not clear enough in the text. We have added (l.152 track changes):

  Particles are tracked until they have lost more than 99% of their initial mass in the most conservative scenario of $\tau_{beach} = 150\ days$. This means that particles are deleted when they have spent more than 691 days near the coast.

  And, for further clarification (l.259 track changes):

  One benefit of adding beached litter fluxes from the Lagrangian particle simulations, is that potential sources of litter far away from the beaching location can be included. While the radius of influence for all features goes up to 100 kilometers, the Lagrangian model features can still include information from further away, since the virtual particles are tracked indefinitely as explained in Section 3.1.2

- Secondly, the most important factor identified is indeed related to a lead time of 30 days, namely the tidal variability within 30 days. However, tides are periodic, and with a period of 30 days we are able to capture the most important variability up to the spring-neap cycle. Extending the period of time would not add much more information to the model.

l. 31. influence: please specify in which way(s)?
Added *'..., with more litter accumulating in areas with increased backshore vegetation.'*
l. 40. move 'e.g.' to before the first reference
Removed the e.g.
l. 53. we will build
Adjusted
l. 83. 'all averaged over August': this carries the implicit assumption that the plastic that was found beached recently. Is that true? See also lead times remark above.
Previous studies (e.g. Ryan et al. (2014), Eriksson et al. (2013)) have shown that the litter turn-over rates are much faster than time scales of more than a month. When beaches were cleaned daily for one week (Ryan et al., 2014), this yielded 2-3 the amount of litter compared to cleaning once a week. Compared to cleaning once a month, it yielded an order of magnitude more litter (Eriksson et al., 2013). This means that with the time scales that we consider, our model should be able to capture most of the accumulated litter.

Figure 1, caption: mean surface currents
Added 'surface'
Table 1. Please add, for each variable/data set, the time period used (August?? Don't think so, but I'm not sure now...). Explain these choices in Section 3.1.1.
We have added additional clarifications to the table caption:
For variables with an asterisk (*) data are used from July up to September 2014-2019. For data with a double asterisk (**) data are used for all months from January 2011 up to September 2019, as these are used for the Lagrangian model simulations as well.
l. 218. Lead times. See above. Why not more than 30 days?
See first response, and response to l. 83. Also, we have added further clarification to the text (l.224 track changes):

For lead times, we will consider 1, 3, 9, and 30 days. As shown in Eriksson et al. (2013) and Ryan et al. (2014), the turnover of litter on beaches generally happens within time scales of days, meaning that with this range of lead times we should be able to capture most of the litter accumulation. Furthermore, a lead time of 30 days also captures all tidal variability up to and including the spring-neap cycle.

l. 235. We use salinity (S) as a proxy...
Adjusted
Table 2. Use S for salinity as a header instead of sal.
Adjusted

l 260. what: which
Adjusted

l. 287. Correlation coefficient: was this calculated on the 'raw' data or on the log-transformed data? If the latter, I'm not sure if this should be called 'reasonable' correspondence as log-transformation imposes a strong bias on (perceived) correlations?
This is calculated over the log-transformed data, as is usually done when comparing (plastic) concentrations with observational data, as we are just as interested in variations in low litter concentrations as for high litter concentrations. Given the estimated error bounds from the variogram analysis, and the fact that 94% of the data fall within these estimated $\pm 2\sigma$ confidence bounds, we argue that there is a reasonable correspondence.

l. 306. 30 days lead time: here it is again...
See first response, and response to l. 83

l. 332-334. You can only draw this conclusion if the relative magnitude of these sources is realistically implemented in the model in terms of numbers of particles released. I'm not sure if this was the case (or if we know enough about sources to do this anyway)?
We acknowledge that this was maybe too strongly worded, we changed this to (l.346 track changes):

This could indicate that transport of litter through the marine environment is important to take into account, as opposed to only considering local terrestrial sources.

l. 373, l. 420, l. 421: what: which
Adjusted in line 420 (for 'variables', since there is a limited number of these), but still use 'what' for 'spatial variability' and for 'length scales'

Figure C1. The fonts are too small to read at 100% magnification
We are sorry about this, but we are not able to make this easily readable at the standard magnification with the many features that we have. The figure is exported as a pdf to enable zooming and close inspection of the figure for the interested reader.