

Interactive comment on “Diagnosing transit times on the northwestern North Atlantic continental shelf” by Krysten Rutherford and Katja Fennel

Anonymous Referee #2

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General comments

The paper “Diagnosing transit times on the northwestern North Atlantic continental shelf” by Krysten Rutherford and Katja Fennel is a study aiming to detect retention times, mean ages and transport pathways of water-masses of different origin in the northwestern North Atlantic using two passive tracers: dye tracer and age tracer.

In principle the paper is well written and can be already suggested for publication in “Ocean Science” with minor/moderate revision of current state.

Major comments/suggestions and questions

The major concern is the selection of the time period for the analysis. Namely, is there some sort of inter-annual variability in the circulation system that can somehow

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change the results? For example the authors have not found evidence of strong upwelling events in the region, which have previously been indicated by other authors (e.g. Shadwick et al. 2010 and Burt et al. 2013). According to Shadwick et al. (2010) and references therein, coastal Scotian shelf is a well known for coastal upwelling events and these have been successfully produced also by modelling studies (e.g. Donohue, 2000). In this study, the authors did not find any evidence of upwelling induced transport. Why is that?

Second concern is associated with the first one: namely, if the selected period did not have any upwelling events in the region, perhaps the study should be extended for longer period to have full view of the circulation in the region. Nevertheless, if there were upwelling events during the selected period, but the model was unable to re-produce them, perhaps the global atmospheric forcing (ERA-Interim) should be replaced by some regional product, which might have better spatial resolution and also better representation of the local weather climate – the wind patterns for example.

Third concern is also somehow associated with the first one: namely, the temperature and salinity are nudged towards climatology in the open boundaries. This should remove inter-annual variability of temperature and salinity at the boundaries, but how large is the latter?

Minor comments/suggestions and questions

1. Use chronological order of references in the text.
2. Page 2, section “Introduction”, lines 13-16: Authors state that for the region this is the first study of residence times, transport pathways and timescales in the NW North Atlantic. Nevertheless, for discussion, they have found several studies, which to compare their results to. Therefore, I would add general statement about other studies.
3. Please state explicitly if you are using ERA-Interim forcing instead of too general statement in page 8 lines 9-11: ... surface forcing from the European Centre

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for Medium-Range Weather Forecasts (ECMWF) global atmospheric reanalysis Dee et al. (2011) ...

4. The location of the stations used for histograms in Figure 8b could also be shown in Figure 1.

5. The number format in Table 1 could be consistent – there is no need for scientific notation and I recommend replacing scientific notation with decimal notation.

6. In Figures 4 and 9 the initial location of tracers could be shown by shading the geographic area or drawing solid contours.

7. Page 17, line 15: be more precise with the origin of the differences with Sharples et al. (2017). The statement is too general.

8. Can dye and age tracer leave the model region i.e. are open boundaries used also for those tracers?

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