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Ocean Science Discussions

Interactive comment on "Storm-driven across-shelf oceanic flows into coastal waters" *by* S. Jones et al.

Anonymous Referee #2

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In "Storm-driven across-shelf oceanic flows into coastal waters", Jones and colleagues investigate the occurrence of High Salinity Pulses at a coastal location on the Scottish continental shelf. The work builds on drifter deployments from the FASTNEt research project, a sustained mooring/coastal observatory and numerical model simulations combined with particle tracking. Although the results rely on observations from two drifter tracks, they are well supported by information from the mooring and numerical model, suggesting the results are robust. The authors elaborate their analysis to investigate the occurrence and drivers of these HSPs in a longer time series record, linking to NAO and gale force wind variability.

This work is a valuable contribution on the subject of ocean-shelf exchange and the implications for conditions in shelf seas.

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Discussion paper

The manuscript is well written and structured, and I would recommend publication. I have some queries below, which I think are relatively straightforward to address and will, in my opinion, improve the overall manuscript.

L101-104: What is the weight we can attach to two drifter observations? The region has been extensively studied using drifter deployments. Are there other historic records that provide context to the occurrence of such a transport pathway? Further in the MS, the authors use a numerical model to provide context, but I wonder if the historic observational record should also be further explored.

L159-161 & Figure 3: Are these the blue points in Figure 3a? Please edit the caption of Figure 3a appropriately.

L161-162: Why was the experiment repeated five times? Is this to provide more tracks with a CPU-manageable method, or did the five different experiments have different parameters?

L169: Is T in Equation 2 the same as t in Equation 1?

L170-172: How sensitive are these results to the chosen horizontal eddy diffusivity?

L202-205: Where does off-shelf transport occur? Does this transport contribute fully to the pathway which leads into the North Sea?

L212-218 and Figure 9: Although not yet part of the UK Met Office/Met Eirean storm naming, these winter storms were named. I would recommend including their name as part of the text and Figure 9, as these are often used in other analyses: Xaver (5-6 December), Bernd (18-19 December) and Dirk (23-24 December).

L226-230: The choice of words here ("backward particle tracking experiments") is confusing. From my understanding, the authors performed a particle tracking experiment where particles were released from a source, and only those tracks which reached the observation location during the observation period were further analysed (see L162-163).

L244-246: Why were two different experiments used? Are these two from the five mentioned on L161-162? Or are these two times an experiment with 5 particle tracking simulations?

L302-304: Does the TPM record show such occurrences, i.e. where the temperature also changes in line with the salinity change? Figure 2 shows gaps in the salinity record at TPM, are more temperature data available which would then potentially allow an analysis of HSP-like events in the temperature record? On L413-414 there is a suggestion that the TPM had temperature data prior to 1994, which could be analysed in such a manner.

L346-347, Figure 2 and L253: If a cluster of low-pressure systems is a pre-requisite for the occurrence, are HSPs a winter-only phenomenon? How many HSPs occur outside the winter season? Could Figure 2 be edited so the identified HSPs are also plotted on (maybe a marker along the 33.5 or 35.5 salinity level)? I would also recommend changing L253 to say “winter storms”.

Bathymetry contours in figures: The model bathymetry is based on the EmodNet data product. I would suggest contours based on this product in all plots.

Figure 2: In the discussions PDF, this figure didn’t occupy the full width. This could be due to the editorial system, but I would recommend for the authors to check there is no unnecessary white space in the image. I think this figure merits a full A4 width space, to make sure it is legible.

Figure 8, caption: please add "(in red)" after "Bathymetry contours". As far as I could tell, this was also only the 500 m one, so I would suggest "Bathymetry contour (red) ... "

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