Reviewer's comments

Lagrangian particle experiments have been widely implemented to quantify Agulhas leakage. But there are many subtle nuances between different configurations (i.e., the tool of choice, frequency of particle release, the definition of leakage water, etc.) In a simulation of a 1/20 deg ocean model (INALT20), the authors compare the Agulhas leakage estimates and their variability using the widely-used Ariane tool to a modern and actively developed tool, Parcels, over a wide range of configurations. There are three major parts of the result: (1) Validate Parcels to Ariane (2) Experimenting various designs in Parcels, and (3) thermohaline characteristics sampled by trajectories using Parcels.

This work serves as a validation to the newly developed Parcels. It also addresses some common confusions of implementing Lagrangian experiments. Moreover, the discussion of Thermohaline changes of various water types along the Agulhas Leakage pathway is a great addition. The writing is of excellent quality with extensive references to the topic. Once some comments are addressed, I recommend accepting this paper.

Comments:

- It might be better to add a table to summarize all Lagrangian experiments/designs included. The readers have to go deep into the sentences to find the differences between Ariane, Parcels, Parcels-ACT, and the tests of different referencing dates.
- Perhaps add more lines to justify why only run Ariane in `quantitative mode` and why only doing Water Chacrateristic analyses in `Parcels`
- L.128. So particles are released over one year and advected for extra four years, maximum transit time four years, but full experiment length five years?
- L.129. Could you please elaborate on why the Release Strategy of Ariane has to be done in such a way? (four particles at the 1/4 of 5days, and another four at 3/4 of 5 days)? Why is this not necessary for Parcels?
- L. 160 I still don't fully understand how the number of release particles is determined in each box with a Maximum of 0.1 Sv. I assume something like this? if a grid box with transport <0.1 Sv, if say 0.35 Sv, release 3 * 0.1 + 5 * 0.01? Perhaps a concrete example here can help new users of Lagrangian tools.
- L. 188, not very clear to me how a "local density changes of each particle" is calculated. I assume it's the Density difference (from Potential Temperature and Salinity) divided by the time that particle crosses the bin. So this has to be calculated per bin/per particle?

- L. 191, why the sum of all particles has to be multiplied by the length of each particle's trajectories? What's in days? The "length of the trajectory," or the "cumulative sum of transport multiplied by the length of trajectory?"
- Fig. 2: why not include the P-ACT in the bar plot? It would be interesting to see if P-ACT at all other sections.
- I like the reasoning for choosing release year as the reference date, including the evidence of fast transition time to 20E, and the strong mixing between 20E and GH line.
- L. 405: I understand that thermohaline properties are equally important. Are there more references/citations of increasing heat/salt fluxes?
- L. 418: ",for example," It's nice to state the drawback/advantage of P/A and the future opportunities to use P, but it seems not to be a good idea to conclude this great work. Maybe some reorganization for the last paragraph.