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Ocean Science Discussions

Interactive comment on "Transit and residence times in the surface Adriatic Sea as derived from drifter data and Lagrangian numerical simulations" *by* P.-M. Poulain and S. Hariri

Anonymous Referee #1

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This paper describes an interesting piece of work combining experimental data and modeling to get at a better insight of the large scale dynamics of the Adriactic Sea.

The paper is easy to read, and properly organized and illustrated. It provides the continuation of the work that has been carried out for years now by the first author with consideration for residence time and transit times.

More details about the parameterization of the horizontal turbulent transport should be given in the paper because it forms a central issue of the current study. An external reference (published before all the details were available) is not sufficient. Please explain how σ_x, σ_y and the integral time scales were computed from the data. What kind

of variability do they describe ? At which time and length scales ?

Basically, the assumption made in this paper is that the flow can be split into a constant climatic mean flow with random fluctuations that can be described by means of a random flight model. Considering that the actual fluctuations contain well organized seasonal variations (with time scales similar to most of the characteristic residence time and transit time computed in the manuscript) that can hardly be described by a random flight model. The numerical results are therefore questionable. The effect of the (organized) unsteadiness of the flow must be commented/investigated.

The statistical results provided by the authors appear also much less solid than presented. From a statistical point of view, the procedure that consists in using sub-tracks from a given drifter as independent realization is highly questionable. For instance, 1800 tracks connecting the sample areas (p 204) to the Otranto section are reported while only 358 drifters are available. The statistical bias introduced by this procedure must be carefully investigated. Most of the statistics presented rely on a rather small number of independent realizations and suffer therefore from the same bias.

Also, the number of numerical drifters appears much to low for the Lagrangian statistics to be meaningful : eight numerical particles at each grid point do not provide a robust assessment of the long term transport properties. The convergence of the numerical procedure with respect to the number of numerical drifters must be investigated. With a steady state flow, much smoother distributions that those shown in figure 2 are expected.

In passing, remove the wrong sentence (p 202) stating that robust statistical results are obtained because the number of numerical particles is much larger than the number of real drifters.

The effect of the divergence of the reconstructed 2D flow - creating artificial sink or source regions - should be commented.

For the above reason, it is unclear if "more accurate and robust results" are obtained as claimed in the conclusion.

The discussion of the results is also rather poor. Numerical results are obtained which, obviously, show some sensitivity to the model parameters but little is said about what can be done with these results. . .

More specific issues.

In equation (1), U seems to be a 2D vector (boldface) but is added to the turbulent transport u' that, according to equation (2) and the explanation below appears as the zonal direction only. This must be corrected.

The effect of the duration of the simulation is unclear. In page 204, the maximum transit time is reported to be 737 days. In table 1, some particles appear to be still present in the Adriatic.

Interactive comment on Ocean Sci. Discuss., 10, 197, 2013.