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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

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We thank Referee 1 for its important and positive comments. The revised text has been improved using most of them. Here is our specific responses to these comments:

Spatio-temporal variability of the Adriatic residual currents, which include variations at mesoscale, synoptic (wind-driven), seasonal and inter-annual scales and also geographic inhomogeneities, is considered as horizontal turbulence (random fluctuations) characterized by variances in the zonal and meridional directions, and a decorrelation scale (Lagrangian integral time scale) as estimated from the drifter data by Poulain (2001) or Ursella et al. (2006). Residual currents are defined with respect to a mean

circulation averaging the drifter velocities in circular bins of 10 km radius. As mentioned in the conclusions, the drifter dataset is not dense enough to consider the seasonal or wind-induced (Bora vs non-Bora, or Sirocco vs non-Sirocco) variabilities in a deterministic manner. The goal here is to use the simplest advection-dispersion statistical model to construct simulated drifter trajectories from which transit-residence times can be calculated and compared to the same statistics computed from real drifter tracks. The above-mentioned variabilities can be considered deterministically using a hydrodynamical model of the Adriatic circulation forced by real winds and integrated over many years. This is beyond the scope of the present work.

We believe that integrating 1000 numerical particles over 750 or 1000 days provide results which are rather robust and we are confident that considering more particles would not change significantly the results. A detailed sensitivity study varying the numbers of particles is beyond the scope of the paper and would probably be useless. We did not remove the sentence in page 202 because we are confident that our transit-residence time statistics are less biased and the number of numerical particles without mortality considered provides a dataset much larger than the one based on 358 real drifters affected by "mortality"(with a typical half life of 40 days).

The mean circulation field derived from the drifters might indeed include some areas of divergence or convergence which might affect the numerical trajectories. Since the random fluctuating currents can be as strong as the mean currents, we expect that the possible trapping due to convergence of the mean flow will be negligible with respect to the dispersion due to the random fluctuations.

As stated in the discussion, the main results of transit times to exit the Adriatic Sea and after entering the Adriatic Sea, and the residence time estimates can be useful in studies of surface transport and dispersion of anything that floats at the sea surface or that is location near the surface (oil spill, other pollutants, mines, dead bodies, biological properties, species with limited self-motion, etc.).

Equation 1 was corrected. The turbulent velocity is now a 2D vector.

Using 1000 numerical particles, the maximum transit time to exit the Adriatic via the Otranto Channel is indeed 737 days and after 750 days only 14 particles are still drifting in the basin. Integrating over 1000 days reduces the number of particles remaining in the basin to 2 units. Table 1 shows that the main results (mean transit times and residence times) are not varying a lot when integrating over 750 or 1000 days.

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