Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2018-65-RC1, 2018

Ocean Science
Discussions

Interactive comment on "Linking sardine recruitment in coastal areas to ocean currents using surface drifters and HF radar. A case study in the Gulf of Manfredonia, Adriatic Sea" *by* Roberta Sciascia et al.

Anonymous Referee #1

Received and published: 26 September 2018

Review of the manuscript "Linking sardine recruitment in coastal areas to ocean currents using surface drifters and HF radar. A case study in the Gulf of Manfredonia, Adriatic Sea" by Sciascia et al

The paper investigates the residence times of passively-advected particles within the Gulf of Manfredonia (GoM) and the connectivity of the GoM to other coastal areas of the Adriatic using CODE surface drifters and HF radar. Assuming that sardine eggs/larvae are passive particles advected by oceanic surface currents, the results can be interpreted as the retention times of larvae inside the GoM and import of larvae from other

spawning areas (SA's). Short retention times and relatively large connectivity values resulting from this analysis suggest that larvae in the GoM are not likely to be spawned there and are more likely to get advected from other SA's.

The paper is interesting, easy to read, and presents clear conclusions. However, I recommend addressing several comments and questions below before it can be published.

1) Connectivity analysis is based only on "direct" drifter trajectory segments connecting 9 SA's to GoM. It would be interesting to see if slightly more sophisticated mathematical methods such as, for example, the transit matrix approach (where the probability matrix showing connectivity between different bins over short time T_transit is constructed based on drifters, and then used iteratively to obtain connectivity over longer times) or multi-iteration approach (where segments of different trajectories that run through the same bin are stitched together to construct a more comprehensive drifter dataset) would give similar results.

van Sebille, E., M. H. England, and G. Froyland, 2012: Origin, dynamics and evolution of ocean garbage patches from observed surface drifters. Environ. Res. Lett., 7, 044040, doi:10.1088/1748-9326/7/4/044040.

van Sebille, E., and Coauthors, 2015: A global inventory of small floating plastic debris. Environ. Res. Lett., 10, 124006, doi:10.1088/ 1748-9326/10/12/124006.

Maximenko, N. A., J. Hafner, and P. P. Niiler, 2012: Pathways of marine debris derived from trajectories of Lagrangian drifters. Mar. Pollut. Bull., 65, 51–62, doi:10.1016/j.marpolbul.2011.04.016.

Rypina, I. I., D. Fertitta, A. Macdonald, S. Yoshida, S. Jayne (2016). Multi-iteration approach to studying tracer spreading using drifter data. J. Phys. Oceangr., 47, 339–351,doi: 10.1175/JPO-D-16-0165.1.

2) What is the average lifetime of the drifters? And how does it compare to the transit

times from different SA's to GoM? If comparable, could it influence/bias the results? The two methods mentioned above could help eliminating/reducing this possible bias.

3) It would be helpful to show mean+/-std transit times from the 9 SA's to GoM in Fig. 5c.

4) It is not clear whether absence of eggs and larvae <15 mm in the GoM during the 2 cruises indicates that sardines do not spawn there, or that sardines do spawn there but the eggs and larvae have been advected out of GoM by the time of the cruises.

Have eggs ever been found in the GoM?

Is GoM a known spawning area for sardines?

5) Would other factors such as water temperature, salinity and nutrients be important for spawning in the GoM and for the larval development, and if so, do conditions in the GoM meet the necessary requirements?

6) What would be the role of active horizontal swimming of larvae? Is active swimming speed of larvae comparable or much smaller than the typical velocities in the GoM and other areas of the Adriatic?

7) Authors suggest that larval vertical migration down to 20 m will not change their results because the currents in the GoM and in many parts of the Adriatic are primarily barotropic and thus depth independent.

What is the mixed layer depth in winter throughout the Adriatic? If <20m, why would the currents be the same within and below the mixed layer (since physics is different for the mixed layer vs below)?

Please provide an explanation about why the currents would be primarily depth-independent down to 20 m throughout most of the Adriatic.

8) Since the paper focuses on GoM, more explanation/info about the physical oceanography of the GoM would be useful – its stratification, major forcing mechanisms, influ-

ence of local vs remote forcing on the circulation, variability of the currents throughout the year, occurrence of eddies and recirculations, importance of tides etc.

9) A picture of the mean circulation in the GoM based on HF radar data would be useful, perhaps with 4 panels showing the mean currents during the 4 seasons.

10) Have deeper SVP drifters been deployed in the Adriatic? How do trajectories of CODE drifters compare to SVP drifters?

11) Radar resolution of 1.5 km might be too coarse to fully resolve near-shore processes. Perhaps, a comparison between real and HF-simulated drifters (ensemble-averaged separation between real-simulated drifters as a function of time, or something similar) could be shown to investigate how well the radar represents the actual currents?

12) The 25 m isobath seems a little arbitrary as the outer boundary of the GoM. Would the residence times change a lot if, say, a 30-m isobath is used instead? Same question about the northern and southern boundaries of the bay – would results change drastically if these boundaries are moved a bit?

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