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Interactive comment on "Surface transport of DOC acts as a trophic link among Mediterranean sub-basins" *by* Chiara Santinelli et al.

Anonymous Referee #1

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The authors use data from a 6-station hydrographic section off the SW coast of Italy in the Tyrrhenian Sea to state that surface advection of Atlantic sourced water plays a crucial role in shaping DOC distribution in the Sea. This makes sense, of course, and is pretty obvious.

What I would find more interesting, if the authors agree, is the following set of processes: 1. DOC-enriched Atlantic Water is transported into the Tyrrhenian Sea where, in the net, it continues to escape remineralization while in the surface layer (as evidenced by the absence of change in concentrations or stock during summer). 2. It is then mineralized in support of upper mesopelagic microbes once winter overturn occurs. In this model, the DOM supporting the mesopelagic microbes is imported from outside the Tyrrhenian Sea, a story that is a bit more novel and defensible than the

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one presented in the paper. This story remains consistent with the Conclusions of the manuscript.

Mechanism 1 for explaining the distribution of DOC concentrations: The authors write that “the anticyclone may determine dynamical regions where DOC can accumulate” But DOC doesn’t “accumulate” by physical means, except for modest concentration by evaporation. Instead, DOC “accumulates” by biological processes. So I agree that the circulation will dictate where the DOC is present (in terms of elevated concentrations), but I do not understand how fluid trajectory controls “accumulation”. The authors similarly wrote that “DOC is a passive tracer on the temporal scale of months; as such, its concentration can be strongly affected by the geometry of the advecting velocity field.” This does not seem correct to me; the geometry will control distributions (which we see via concentrations), but it will not control (through alteration) concentration directly. The authors then direct the reader to Fig 5, where we see that the higher concentrations of DOC during August are at the ends of the section, where the authors see strong negative values of lambda. They say “strongly negative values of lambda {are} where the areal concentration can increase”. Again, I do not see where stretching or broadening the trajectories of the surface flow (as lambda indexes) will actually change concentrations of DOC. Narrowing the flow of a specific water will reduce the spatial extent of the associated DOC (just as a river’s spatial extent varies between broad and narrow sections along its path), but I do not see it changing concentrations in that flow. Perhaps I do not adequately understand the writing in this section. If so, the authors need to improve the clarity.

Mechanism 1 for shaping the horizontal distribution of DOC is explained in a long paragraph, but Mechanism 2 is not further addressed at all.

As for Section 3.5 “DOC annual cycle” 5/30: “DOC likely due to biological production resulting from the phytoplankton blooms in the Algerian Basin.” There isn’t really a way to know if the DOC was produced there, or somewhere further up stream, such as in the North Atlantic itself. The authors should tell us if the DOC entering the Med Sea

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from the Atlantic is lower/higher/equal that present in AW present in the TYR; if higher, then a source in the Med Sea is required.

Specific Comments Page/Line 1/7: “flux. . .into the basin.” It looks like the flux of DOM is out of the Algerian Basin and into the Tyrrhenian Sea, not into the basin (unless basin refers to TYR). 1/18: I suspect that Copin-Montegut and Avril 1993 would like to be recognized for their work in the Med as well. 3/15: what makes the cyclonic winds in the TYS “global”? I suggest deleting the word. 4/18: The Algerian Current is mentioned for the first time here, but not mentioned in the description of the system’s circulation. 5/12: “to the northwest and south-southeast”. It looks like the section runs from the NE to the SW, not NW to SW, and that is where the green colors under the section are located. 6/2: The term “the basin” has been used a few times in the text, but I’m not sure if this refers to the Algerian Basin or the basin holding the TYR. The authors need to be clear and consistent on that. 6/10: what is the “global cyclonic cell”? Should “washing” be “flushing”? 6/19: why is there a ? in parentheses?

Figures Figure 1: The arrows in Figure 1 used to identify straits are hard to see since they are black, as are the underlying current vectors. Also, I suggest that “ADT” be spelled out in the caption; I found myself having to look it up in the text to remember what it meant. The values for lat and long should include ‘degree’ symbols so that the reader knows what the values refer to. The caption needs to indicate which months were averaged for the winter and summer conditions. Figure 3: I cannot make out the velocity vectors in 1a, so I don’t know which what the vectors are pointing. Units are not given for the vectors. In 3d, I wonder how well observed salinity matches with the modeled salinity shown in the plot. Figure 4: too many words in the caption are capitalized. What is “multi satellite”?

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