

Ocean Sci. Discuss., referee comment RC1  
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## Comment on os-2021-34

Jeffrey Paduan (Referee)

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Referee comment on "Evaluating high-frequency radar data assimilation impact in coastal ocean operational modelling" by Jaime Hernandez-Lasheras et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-34-RC1>, 2021

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I have reviewed the manuscript by Hernandez et al. entitled "Evaluating high-frequency radar data assimilation impact in coastal ocean operational modelling." As the title implies, this study is focused on high frequency (HF) radar impacts as a data source for ocean circulation models. HF radar networks have been proliferating in coastal areas worldwide for the primary purpose of mapping ocean surface currents out to ranges of 150 km with resolution of a few kilometers. The wide-area and real-time coverage derived from these networks makes them an important new tool for managing resources, responding to emergencies, and researching ecosystem responses in coastal areas. The goal of the present study and others before it is to develop and assess techniques for also using the HF radar-derived surface current mapping data as an assimilation source for 3-D circulation models. In this way, the impact of the HF radar observations can be expanded in both space and into the future through the use of models. The topic, therefore, should be of interest to a wide range of managers and scientists.

This manuscript is well written and the illustrations are clear. In addition, the authors provide a comprehensive and helpful review of past results involving the assimilation of HF radar-derived surface velocity. For these reasons, I recommend the manuscript for publication with only minor corrections.

The one substantive concern I have is to insure that the basis for the conclusion that HF radar assimilation improves the model outside the range of the HF radar observations is accurate and consistent. It is mentioned in the abstract, in the final sentence of the conclusions, and in lines 344-346 that the data assimilation improves the results even outside the data coverage area. This conclusion may be true and it is strictly supported by the data, but I don't believe that the independent test data in this particular study is adequate to make the conclusion. In particular, Figure 9 shows that the results in the model domain outside the HF radar coverage area are actually better than they are within the HF radar coverage area. That result is dubious in terms of justifying the conclusion. It is more likely that the currents in the test region outside the HF radar coverage area happen to be very steady leading to a particularly good model-data match in that location, a possibility that is referred to in the text. Hence, I believe that the conclusion of improved data assimilation results outside the HF radar coverage area should be tempered or removed in this particular case.

I find Figure 10 to be particularly interesting and useful in terms of guiding operational systems. It illustrates (and quantifies) the clear benefits of data assimilation for traditional data sets and it shows the added benefit of assimilating HF radar data in addition to those traditional data sets.

MINOR COMMENTS:

Line 38: This sentence is awkward. Please review and revise it.

Line 111: "It operates since" should be "It has operated since"

Line 308 and Figure 8: The text refers to a set of 1000 Lagrangian particles but the figure refers to only 100 particles. Please reconcile this.

Line 406: "this constrain" should be "this constraint"

Line 427: "contrarily to" should be "contrary to the case for"