

Interactive comment on “A data assimilative perspective of oceanic mesoscale eddy evolution during VOCALS-REx” by A. C. Subramanian et al.

Anonymous Referee #2

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Review of MS:

A data assimilative perspective of oceanic mesoscale eddy evolution during VOCALS-REx by A. C. Subramanian, A. J. Miller, B. D. Cornuelle, E. Di Lorenzo, R. A. Weller, and F. Straneo

Summary: 4dvar assimilation with ROMS is used to assimilate satellite and in situ observations from the VOCALS-REx cruise during November 2008. Initial conditions and surface forcing are used as control variables. Results indicate model-data misfit is reduced substantially by assimilation suggesting the analyses reproduce the observed variability. Special attention is given to an intensively sampled eddy and how its structure and evolution is reproduced by the analyses. Heat balance calculations suggest vertical mixing is the key player in the balance.

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RECOMMENDATION: SUBSTANTIAL CHANGES REQUIRED BEFORE PAPER CAN BE ACCEPTED FOR PUBLICATION.

COMMENTS:

- 1) I find the assimilation exercise very interesting and the results worthy of publication. However, in its present form, the paper fails to convey the “data assimilation perspective”: more discussion is required to clarify the role of data assimilation and of the different data sources besides showing reduction in data misfit. Differences between analyses and no assimilation experiments would help a lot, including heat budget estimates with and without assimilation. Comparing results with data not assimilated by the model also indicates assimilation impact, comparing analyses results with assimilated data is not very informative unless the method is not capable to fit some data.
- 2) Given that the purpose of the observational study is to understand air-sea-land interaction processes, it is surprising the authors do not mention anything about how assimilation changes the surface fluxes, which are part of the control variables. This should be addressed/commented.
- 3) There is no discussion on background error covariance and how it is estimated. There is no mention either of the vertical mixing scheme used in the model. Please fix that.
- 4) Special attention is given to a particular eddy and its evolution, but figures do not properly indicate eddy location, etc. This should be corrected. Authors say analyses qualitatively reproduce the observations but the purpose of the assimilation is to be more quantitative and go beyond qualitative resemblance. Please explain. How long is data information retained? Is the forecast for the second 15 day period (after assimilating the first 15 days of data) very different from the analysis after assimilating the whole month?
- 5) Figure 6, for example, does not show substantial corrections in the vertical temper-

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ature structure after assimilation. In fact, visually, data misfit appears to be larger on average after assimilation (compare panels d and f in the figure). However, authors suggest a large data misfit reduction (second paragraph page 8). Please explain.

6) Abstract (lines 9-10) incomplete or incorrect.

7) Figure 8, model velocities overlaid??

8) Beware of caveats regarding the use of Okubo-Weiss for eddy tracking highlighted by Chelton, Schlax, Samelson, Progress in Oceanography (91) 2011.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 20901, 2012.

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