Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2020-79-RC2, 2020

Ocean Science
Discussions

Interactive comment on "Properties of baroclinic Rossby waves in the North Atlantic from eddy-resolving simulations of ocean circulation" *by* Sylvain Watelet et al.

Anonymous Referee #2

Received and published: 11 November 2020

The authors make an attempt at identifying and isolating westward propagating baroclinic Rossby wave signals in the North Atlantic in a model simulation forced by observed atmospheric forcing. While the premise is not unjustified, I found the results to be entirely unconvincing.

For instance, Figure 1 only visually reveals weak signatures of westward propagation and the lines in Figure 2 (smoothed version) are not at all convincing. A wave should be a continuous, linear local peak in a Hovmoller plot. But the lines are drawn over short periods of one-signed anomalies, connected by opposite signed anomalies. That is not evidence of continuous propagation. Perhaps a better interpretation is that waves are

generated over short distances, then damped or interrupted by other processes.

Figure 4 shows a relatively flat 2D-RT phase spectrum for angles less than 45 deg. Is there any evidence the purported peak at 21 deg is actually statistically significant over that background noise? Chelton recanted his concept of fast internal Rossby waves in the satellite observations by instead re-casting the preponderance of westward propagating signals as evidence of nonlinear eddies rather than waves. Only the largest scales seemed to be wavelike in behavior, but they were difficult to dissociate from the energetic mesoscale that dominated their analysis (Chelton et al., 2011). The authors in the present study give no indication that they are aware of or concerned about this updated framework.

The SSH signals include components from multiple vertical modes, which can obscure the signal they are after. Since they have a model, it would be more far more interesting to analyze the full model fields rather than just looking at SSH. Separate the flows into vertical modes, including the barotropic and 1st baroclinic, and maybe even the 2nd baroclinic, so that you can be more unambiguous in following only one internal mode, presumably the 1st baroclinic.

It's not just the NAO forcing that drives the waves. It is the zonally and temporally integrated upstream effects of the wind-stress curl for all time scales at each longitude that matters locally in the oceanic response. Hence, showing lagged correlations of indices in Figure 7 is not particularly interesting or illuminating.

Finally, Figure 8 looks like two (essentially) uncorrelated red-noise time series.

Minor points:

1) All the figure captions should indicate that "model SSH" is being analyzed and plotted.

2) Throughout the text, many of the numerical estimates indicate "four significant digits" accuracy. Really?

Reference: Chelton, et al., 2011: Global observations of nonlinear mesoscale eddies. Prog. Oceanogr., 91, 167-216.

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2020-79, 2020.