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Interactive comment on "The INALT family – a set of high-resolution nests for the Agulhas Current system within global NEMO ocean/sea-ice configurations" *by* Franziska U. Schwarzkopf et al.

Anonymous Referee #2

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This paper gives a very thorough description of a family of model configurations focussed on nesting in and understanding the Agulhas System and its impacts on the global circulation. It gives a well structured and informative summary of 7 different configurations at various resolutions, with bases in the ORCA family of models. The configurations share a common atmospheric forcing and vertical grid, and a series of sensitivity studies on resolution and lateral boundary conditions are performed, with comparisons to various observed datasets. Although the manuscript is lengthy, its structure and the details it gives with regards to the configurations and their parameters will make a valuable piece of reference material for future work using these, or other, configurations in the southern hemisphere. The tests using relative, partial and

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absolute winds in particular, add to what is an active research topic in various modelling systems.

The section (3.1.1) on the submesoscale is a valuable contribution to the paper, and is informative and refreshing in its honesty about the challenges and opportunities in the high resolution simulation. With the Agulhas system being tricky to accurately represent in regional and global ocean models, the parameters given in table 2 reveal some of the ingredients to the success of these configurations.

In general the paper is very well written, and with the addition of a few references, and some explanation around the choice of the common atmospheric forcing and vertical grid, is ready for publication.

Specific Comments

Section 1. Line 24: When discussing the generation of Natal Pulses, I think it would be remiss not to mention the work of Tsugawa and Hasumi (2010)

Figure 2: Suggest adding the name of the configuration next to the relevant nest.

Section 2. Line 4: I believe that Cronin et. al. (2013) and Malan et. al. (2019) also make use of INALT01.

Section 2.3 I think it is important here to discuss the philosophy behind using COREv2 as the atmospheric forcing for all experiments. I understand the need for a common forcing across all experiments, although for the higher resolution configurations I believe that the resolution of CORE may be a limitation, as is acknowledged briefly in section 3.1.1 of the paper. Basically I do not think that there is anything wrong with the choice, but think that some discussion of the reasoning behind the approach, and possible pro's and con's, would be instructive, the same comment, to a lesser extent, is also valid for the use of the 46-level vertical grid for all the simulations (page 6, line 6).

Table 10

INALT20 and 60 show a very low number of Natal Pulses during their spin-up period. Why is this?

References: Cronin, M. F., Tozuka, T., Biastoch, A., Durgadoo, J. V, & Beal, L. M. (2013). Prevalence of strong bottom currents in the greater Agulhas system. Geophysical Research Letters, 40, 1772–1776. https://doi.org/10.1002/grl.50400 Malan, N., Durgadoo, J. V., Biastoch, A., Reason, C., & Hermes, J. (2019). Multidecadal wind variability drives temperature shifts on the Agulhas Bank. Journal of Geophysical Research: Oceans. https://doi.org/10.1029/2018jc014614 Tsugawa, M., & Hasumi, H. (2010). Generation and Growth Mechanism of the Natal Pulse. Journal of Physical Oceanography, 40(7), 1597–1612. https://doi.org/10.1175/2010JPO4347.1

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