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The numerical dependence of balanced state in models

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The balanced state in geophysical flows largely describes the dynamics and energetics of these flows. The description and diagnosis of this balanced state however remains controversial. In models, the numerics of the model as well as the balancing procedure used greatly effects the obtained balanced state and the errors involved.

We use two different balancing procedures in an identical model setup and find differences in the resultant balanced state. The first procedure we implement is a non-linear initialisation procedure for higher orders in Rossby number, as in Eden et al. 2019. The second procedure implemented is the optimal potential vorticity balance to achieve the balanced state, as in Tuba and Oliver (2019, in prep.). The results show that the numerics of the model affect the obtained balanced state from the two procedures. The numerical error can be seen in the residual signal which we interpret as the unbalanced motions, i.e. internal gravity waves. Therefore, it is crucial to consider the effect of the numerics in models and make a suitable choice of the balancing procedure to obtain the balanced state.

Do you need an official invitation letter?

No

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