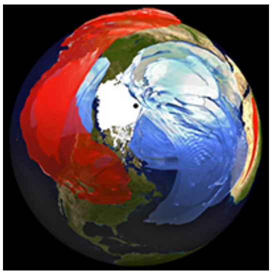

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How does knowledge of atmospheric gravity waves guide their parametrizations?

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Part of gravity wave research is motivated by the need to improve the representation of their impacts on the large-scale circulation in climate models. As a major portion of the gravity wave spectrum is subgrid-scale, parameterizations are responsible for this. Gravity wave parameterizations generally share a common framework, which includes common assumptions on their propagation (columnar only) and their sources (tropospheric only). These assumptions are very justified to leading order and parameterizations have been successful in allowing models to reproduce a number of middle atmospheric features. Once this framework is setup, the choice of the characteristics of the sources is a necessary step but it remains fairly arbitrary, particularly for non-orographic sources, and hence constitutes a prime suspect for errors and uncertainty. As sources are poorly constrained, they are conveniently tuned to improve the modelled atmospheric circulation. Consequently, significant efforts have been carried out to better quantify the sources of gravity waves, combining modeling and observations. This has stimulated formidable progress in our description and understanding of atmospheric gravity waves. Transfer to parameterizations however is not straightforward: knowledge of the characteristics of lower stratospheric gravity waves does not directly translate into input parameters for parameterizations. The example of intermittency is used to illustrate the potential impact of a shift in the parameterization framework, leading to a redistribution of the resulting forcing in the middle atmosphere. The better knowledge of atmospheric gravity waves, obtained in recent years, highlights a number of phenomena which fall outside of the classical framework of parameterizations, notably lateral propagation and secondary generation. This growing evidence calls for investigations to determine which of these phenomena may have systematic and robust implications for the larger-scale flow.

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