

Gravity wave drag parameterization in simulations of the quasi-biennial oscillation

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Abstract

The quasi-biennial oscillation (QBO) is an alternating cycle of westerly and easterly winds which is observed in the equatorial stratosphere. It is well-known that the QBO is driven by the deposition of momentum by waves propagating upwards from the troposphere. However, there has been considerable debate as to the relative contributions of the different types of waves involved: planetary-scale Kelvin and Rossby-gravity waves, and small-scale gravity waves. It is now understood that gravity waves play an important role in driving the QBO, and that their drag must be accounted for in general circulation models by means of parameterizations.

In my lecture, I will discuss gravity wave drag parameterization schemes in the context of simple models of the QBO: a one-dimensional zonal-mean model and a two-dimensional balance model that includes a seasonal cycle and the upwelling of the tropical Hadley circulation. In these models, the drag due to equatorial planetary waves is also represented by a parameterization scheme. I shall discuss the effects of combining the drag from both types of waves, and the constraints on the schemes for simulating the QBO.