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An Updated Parameterization of Convective Gravity Waves by Including Nonlinear Forcing and Its Impact on a GCM (WACCM)

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Recent numerical modeling studies (Song et al.2003; Chun et al.2005) showed that convective gravity waves are generated by two sources: diabatic forcing and nonlinear forcing, and waves generated by either of these two sources are largely out of phase with each other. Consequently, the reference-level (cloud top) momentum flux, which is most important for the parameterization, induced by each source is significantly different from each other and from the momentum flux induced by both forcings. This suggests that a parameterization of convective gravity waves must include both forcing mechanisms to qualitatively and quantitatively represent the reference-level momentum flux spectrum. With this in mind, we updated a convective gravity wave parameterization proposed by Song and Chun (2005) by including effects of nonlinear forcing. The updated parameterization is implemented to Whole Atmosphere Community Climate Model (WACCM) developed at NCAR and three 12-year simulations are performed by without the parameterization, with original Song and Chun (2005)'s parameterization, and with the updated parameterization. It was found that the magnitudes of reference-level momentum flux and resultant drag are reduced significantly in the simulation with the updated parameterization, especially in the Tropics. Effects of the updated parameterization on large-scale circulations and comparisons with original parameterization will be presented in the conference