# Impact of Gravity Wave Drag Parameter Estimation using Data Assimilation on the General Circulation of the Middle Atmosphere

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The impact of using optimal parameters in a gravity wave drag (GWD) parameterization in a simple mechanistic atmospheric model is examined. Gravity wave drag parameters of the Scinocca scheme are estimated using a data assimilation technique. The hybrid assimilation technique uses 4D variational assimilation to estimate gravity wave drag from Pulido & Thuburn 2008 and a genetic algorithm to estimate the optimal parameters of the scheme. In this work, the impact on the general circulation of the middle atmosphere of a mechanistic model, the University of Reading model, using optimal gravity wave drag parameters is examined. A significant improvement of the model is obtained, in particular the RMSE diminishes significantly comparing a simulation with a standard set of parameters and a simulation with optimal parameters against Met Office analysis. Using latitude-dependent optimal parameters, important improvements on the Equatorial zonal winds are found without degrading without degrading high latitude jets. Different definition of the cost function used to obtain the optimal parameters are presented. In particular, a cost function that give more weight to the upper stratosphere - lower mosphere than the lower stratosphere resulted in an overall better performance. Some early results that evaluate the capability of this simple mechanistic model in representing the QBO by means of optimal parameters are shown. To conduct this experiment, the estimated parameters are assumed to change seasonally as expected from gravity wave sources.