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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Differences in the QBO response to stratospheric aerosol modification depending on injection strategy and species" *by* Henning Franke et al.

Anonymous Referee #3

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This article focuses on changes to the QBO resulting from injections of SO2 and H2SO4 into the stratosphere in two global models. Multiple experiments are carried out with each model. It is shown that the QBO does not respond in the same way in the two models and the authors attempt to address the reasons for this building on previous studies on this topic.

The paper is well organized, well written and of scientific value. I do have one major concern though about the interpretation of the results as described below that needs to be addressed before the paper can be published.

Major Concern:

1. The authors explain changes to the QBO in terms of changes to thermal wind balance. Although changes to thermal well balance are there, I am not convinced that they explain how the QBO changes. The QBO is a wave driven phenomenon and its period and amplitude arise from an interaction of large scale waves (resolved in the models), parameterized gravity waves, and vertical and meridional advection (meridional advection is the least important driver) – it is hence most likely that changes to these factors are of crucial importance to the QBO. Vertical advection is mentioned in this paper but I'm not sure why it's not addressed more carefully. Changes in vertical advection directly affect the downward propagation of QBO phases (or the lack of) hence this should be given a larger consideration. Thermal wind balance indeed maybe a factor as it can change the propagation of waves that drive the QBO, but it's difficult to accept based on what is shown here, how a change in the mean state (and balance) explains changes to a tropical oscillation that's primarily wave driven.

Minor issues:

1. Line 303: "slight easterly anomaly up to -3 m/s' – this could be natural variability of the QBO, and not really a change

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