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Geoscientific Model Development Discussions

Interactive comment on "The Extrapolar SWIFT model (version 1.0): Fast stratospheric ozone chemistry for global climate models" *by* Daniel Kreyling et al.

Anonymous Referee #1

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The Extrapolar SWIFT sub-model is described in this work. The purpose of effort is to develop a stratospheric chemical approach for ozone that is fast, accurate, and consistent with model variability of an underlying GCM. This sub-model can then be used in climate simulations (similar to IPCC type assessments) with a low numerical cost. The authors have done an excellent job of laying out the mathematical and engineering approaches and have quantified the error with multiple comparisons to a full stratospheric chemistry CTM (i.e., ATLAS). The approach is unique and is appropriate for publication in GMD. I highly recommend this work to be published (as is). Below is a comment / suggestion that the authors may choose to address.

The authors show in table 1 that there are 9 "basis variables" that are needed to drive Extrapolar SWIFT (i.e., latitude, pressure, temperature, overhead column ozone, chlorine family, bromine family, nitrogen family, hydrogen family, and odd-oxygen). The ATLAS model is then used to create an "extensive training data set" which is used to create the polynomial functions (based on the 9-dimensional hyperspace) of these basis variables. This seems to work exceptionally well, especially for the comparisons shown in Figure 5 (year 2005), Figure 6 (year 2006), and Figure 7 (years 1999-2009). However, what is interesting about the choice of these years for Extrapolar SWIFT model validation is that these years to not have a major volcanic eruption. It would be useful / interesting (to show) how this sub-model responds over say the 1990-1994 period, which encompasses the Mt. Pinatubo eruptions. Since volcanic eruption and subsequent ozone change are important part of historical record and do have a climatic impact this would (in my opinion) add value to this work.

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