

# ***Interactive comment on “D region ion-neutral coupled chemistry within a whole atmosphere chemistry-climate model” by Tamás Kovács et al.***

## **Anonymous Referee #1**

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### General Comments

This is a generally clear, well written paper. The work is of excellent scientific quality, is reproducible and is of high scientific significance:

### Specific Comments

p7, line 5 - a 5 year spin up period seems very long - similar dynamics-only experiments would likely require a considerably shorter spin up. Is the longer spin up chosen because of the very long lifetime of some of the key chemical reactions? This should be explained in the text - others may want to extend these experiments to other time periods and other events and will want to know (for reasons of computational efficiency) whether they need such a long spin up each time.

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p12 Conclusions - given that the rSIC approach was trained using one period of data, and tested using just one period the authors should comment more on the wider applicability of the approach

#### Technical Corrections

p2, line 22 - this states the SIC model has 306 ion-molecule reactions but 307 are listed in the SM

p2, line 29 - WACCM-D, WACCM-SIC, etc are defined in the abstract but I think they should be defined again in the main text.

p4, line 12 - From the SM it is not clear which reactions are the 7 photoionization and 16 photodissociation reactions mentioned in the text (though some will be the ones marked PDE\*) - this should be clarified.

p8, line 2, and Figure 2 - the legend suggests the profiles from two WACCM experiments are plotted on the left hand panels, but the results appear identical and do not appear to correspond with the relative differences plotted on the right hand panels. Either alter the left hand panels to show the differences better or (if the log scaling and range of values makes this impossible) indicate in the text that the differences can only be clearly seen in the right hand panels to clarify and to avoid the reader looking for a needle in a haystack on the left.

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Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-57, 2016.

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