

## ***Interactive comment on “Non-linearity in DMS aerosol-cloud-climate interactions” by M. A. Thomas et al.***

**Anonymous Referee #2**

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**General Comments.** This short paper is about the non-linearity in the aerosol-cloud-climate interactions associated with DMS fluxes. The focus is put on the Southern ocean in austral summer when the anthropogenic influence is low. I find the article to be interesting and well written in general. It is clearly appropriate for ACP. I have a few comments and suggestions as detailed below which should help improving the paper.

### **Major comments.**

- I wonder why the authors have used the model in a nudged configuration while they use a climate model that can generate its own climate. In other words, it seems to me that if one wants to quantify the feedbacks between DMS, aerosol, and climate in a comprehensive manner, maybe one should consider how the changing DMS/aerosols/clouds may actually affect the climate and (possibly) further influence

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the DMS fluxes. This is my main concern regarding the paper and the Authors should discuss this issue in details. For example, could the Authors provide a possible estimate of how their results would be changed if they were to use the model in a free climate configuration?

- There is no indication in the paper about the skills of the model regarding the representation of DMS and the related species SO<sub>2</sub>, sulfate etc. in the Southern Ocean in particular. This may be discussed in Thomas et al. (2010) but as the current paper should be standalone, it would be good to provide some indications in particular for the species relevant for the current study

- In section 3.2.1, the Authors state that “The vertically integrated atmospheric liquid water remains constant in all simulations”. What are the implications of such hypothesis for the results ?

- The Authors mention that “The present study would provide useful insights in evaluating [the effect of iron fertilization]”. Could they further discuss this and, for example, place their results in the context of proposed experiments in terms of iron fertilization?

### **Minor comments.**

- Page 15236 l3: diminsh -> diminish ?

- Page 15237 l1: what is meant by “cloud top cloud droplet effective radii”?

- The reference (Rast et al., JGR, submitted 2008) probably needs to be updated.

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