

Review of Kipling et al Constraints on aerosol processes in climate models from vertically-resolved aircraft observations of black carbon.

This paper is very well written, and describes the use of novel data from the HIPPO campaign comprising many vertical profiles of black carbon taken across a global scale to evaluate two state-of-the-art aerosol models.

The issue of vertical profile of absorbing aerosols is an important one since the relative location of cloud and aerosol can change the magnitude and even sign of the radiative forcing. The paper correctly points out that comparison with aircraft observations is the only real quantitative method of doing this, however the limited temporal and spatial scale of many of the field campaigns also restrict the usefulness of the comparison. This paper is using novel data, and in a novel way, by sampling the models along the flight tracks of the vertical profiles. It should therefore be published as it both demonstrates new methods, and gives new information on real vertical profiles, and simulations of the same.

I find a few minor points that I would like the authors to consider before publication.

Introduction, paragraph 1: aerosol radiative effects can also change the regional and local circulation, please mention this as a possibility here alongside the other effects already included.

Page 439, Line 20, please include/consider references by Johnson et al (2004) and Johnson (2005) which are classic examples of the importance of vertical profile for direct and semi-direct effects.

Page 442, line 15 does “this paper” refer to Schwarz et al (2010)? – please make this clearer.

Page 442, line 15. Too many “however’s in the last sentence!

Page 447, please add more details on how the nudging is done, as this is still a new technique in climate modelling.