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Interactive comment on "The CCCma third generation AGCM and its extension into the middle atmosphere" *by* J. F. Scinocca et al.

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We thank the reviewer for his or her comments. We agree that it is difficult to decide just how much or how little detail to include in the description of a full-physics GCM. While some of the material presented has been discussed separately in previous papers, we believe that a complete summary is very useful. In addition, the present paper documents the configuration which underlies the model's application in the recent IPPC AR4 and WMO ozone assessments as well as the upcoming CCMVal report. In this regard such a summary is timely and necessary.

The polar temperature bias discussed in Section 3.3 is a common issue in middle-atmosphere chemistry models which seek to model polar ozone loss. As discussed in Section 3.3 (p. 7908 l.9-17) other modelling groups (NCAR and Hadley Centre) employed similar adjustments to orographic gravity-wave drag in sensitivity tests of

their models. In terms of the bias in the breakdown of the springtime SH polar vortex, as discussed in Section 3.4 (p.7909 l.22-24) this is a common bias among the chemical climate models participating in the last WMO ozone assessment (Eyring et al 2006, Fig 2).

The QBO generated by the MPI model is forced by both parameterized and resolved waves. The QBO produced in by AGCM3 in Section 3.5 is forced by both parameterized and resolved waves. In this sense, if the former is considered spontaneous then so is the latter.

Our reference to the resolved waves being a property of the GCM stems from the fact that one has little direct control over the properties of the resolved waves. As the reviewer points out, such waves depend on the choice of parameterized deep convection as well as the treatment of large-scale precipitation (e.g. cloud microphysics scheme). Until very recently, these choices have been based primarily on the fidelity of the modelled tropospheric climate and their connection to the properties of resolved waves has remained less studied. In this sense, the spectrum of resolved waves in any GCM is a property of the the way in which the tropospheric climate was chosen to be modelled (i.e. essentially a property of the model). This has lead to a postiori checks of the properties of waves (e.g. Horinouchi et al. 2003 referenced on p. 7911 l. 24).

A complete discussion of the nature of resolved waves in AGCM3 and its connection to parameterized convection and large-scale precipitation can be found in Scinocca and McFarlane (2004) (referenced in Section 2.7 of the manuscript). That study was in part motivated by the Ricciardoulli and Garcia work and considers the validity of the resolved waves in AGCM3. In revising the manuscript we will point to this reference in the section on modelling the QBO by adding the sentence, "A detailed study of the the properties of resolved waves in AGCM3, and their relationship to tropical convection, can be found in Scinocca and McFarlane (2004)." on P 7911 L.26 of the original manuscript.

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