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Interactive comment on "Comparison of the CMAM30 data set with ACE-FTS and OSIRIS: polar regions" *by* D. Pendlebury et al.

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P11183 L4: Why do you nudge winds? To my understanding, primary predicted variables by ERAI and CMAM are vorticity and divergence in spectral space. Nudging these quantities for low wave numbers would straightforwardly achieve the scale selection of nudging. Technically, the nudging of "winds" is by nudging vorticity and divergence in spectral space. The nudging of "winds" is conceptual. A note has been added to this effect. -> "winds (through vorticity and divergence)" P11184 L10ff: Why does CMAM not account for sedimentation of PSC particles? The presence of this process is well established even though actual sedimentation velocities are subject to substantial uncertainties due to their particle size dependence. Other CCMs that I have

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heard of all include this process. This version of CMAM does not have sedimentation and it is necessary to point this out. We have been reluctant to include denitrification and dehydration because of the difficulties this presents to mass conservation using our current tracer advection scheme. The nitrogen and water are sequestered into the aerosol phase, so for the duration of the PSC existence the gas-phase concentrations of NO_y and H_2O are significantly reduced, though we recognize some drawbacks with this approach that are explored here. P11185L1: What is "nodding"? Please explain or replace with a more common word. The paragraph has been modified to remove "nodding" and explain how the satellite scans the atmosphere. P11187L1ff: Please correct the placement of brackets for the references. The placement of brackets for the references is consistent with ACP guidelines. We will change if required by ACP staff. P11188L5: The formula should be MAD(x) = median|xi ôĂĂ̆ median(x)| (i.e., replace one set of brackets with vertical bars). Changed as noted. P11188L25: Replace "washing out" with "obscuring" or similar. Changed as noted. P11191L23: Remove "the" before "methane". Changed as noted. P11192L8: "Weak" dehydration is not a surprise considering the model does not include dehydration (see above). Please indicate here that this is as expected due to the model's formulation. Added "which is unsurprising given the lack of PSC descent". P11192L22: In terms of ozone mixing ratio, any transport of ozone-rich air from the mesosphere would not cause a "build-up" of ozone because transport alone cannot change the mixing ratio. If there is too little mass transport out of the bottom of the vortex, continuity suggests there is also too little transport into the vortex from the mesosphere. So I have trouble accepting this dynamical explanation. You would need to assess rates of descent in the vortex to make a statement on this. The paragraph has been rewritten to remove the term "build-up" and to include the diabatic descent and horizontal mixing as: "...either chemical destruction of ozone during winter and spring is too low and dehydration of the polar vortex (e.g., due to PSC formation) is too low, or the polar vortex is too isolated with too little horizontal mixing out of the lower stratospheric vortex and too much diabatic descent within the vortex. The latter problem would allow an increase in ozone due to

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ozone-rich air descending from the mesosphere inside the polar vortex. It may also account for an increase in water vapour in the lower stratospheric vortex, ..." P11193L3: "underestimation" Changed as noted. P11193L16: How do you "scale" PV? What is the scaling factor? Please expand or give a reference. Reference to Manney et al 2007 added at first mention of sPV (in the section on ACE-FTS observations). P11193L24: "the diurnal cycle of ozone becomes" (singular). There is just one diurnal cycle, I think. Changed as noted. Figure 1: Areas with missing data for the satellite should be marked as such. Here they are rendered as 0, which sets up artificial gradients along the boundary. Ditto also in some other plots. Plots 1 to 10 have been changed as noted. Figure 9: The caption is imprecise. For temperature, you're actually displaying the absolute difference (in units of K). The annotations are practically unintelligible when printed; please use a larger font. Dito for figures 10, 11, 12, 13, 14. Changed in Figure 9 caption to : "Time series of absolute differences for temperature (a) of coincident profiles between CMAM30 and ACE-FTS for 90S to 60S, and of relative differences for ozone (b), ...". No other captions make this distinction between 'absolute' and 'relative'. Font size for figures 11 to 14 has been increased. Hopefully, the final figures will be big enough to be legible. "Absolute" also added to figure captions for figures 1 and 3. Figure 13: The phrase "sPV <> _1:2 PVU" requires expansion. For "sPV" see above comment. You probably want to write that "sPV < ôĂĂĂ1:2 PVU in the SH and sPV > 1:2 PVU in the NH". Changed to "Top panels show the area of polar vortex defined as sPV > 1.2 PVU (blue) for the NH and sPV < -1.2 PVU for the SH,..."

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