# Enforcing conservation of axial angular momentum in the atmospheric general circulation model CAM6

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## Supplementary Material

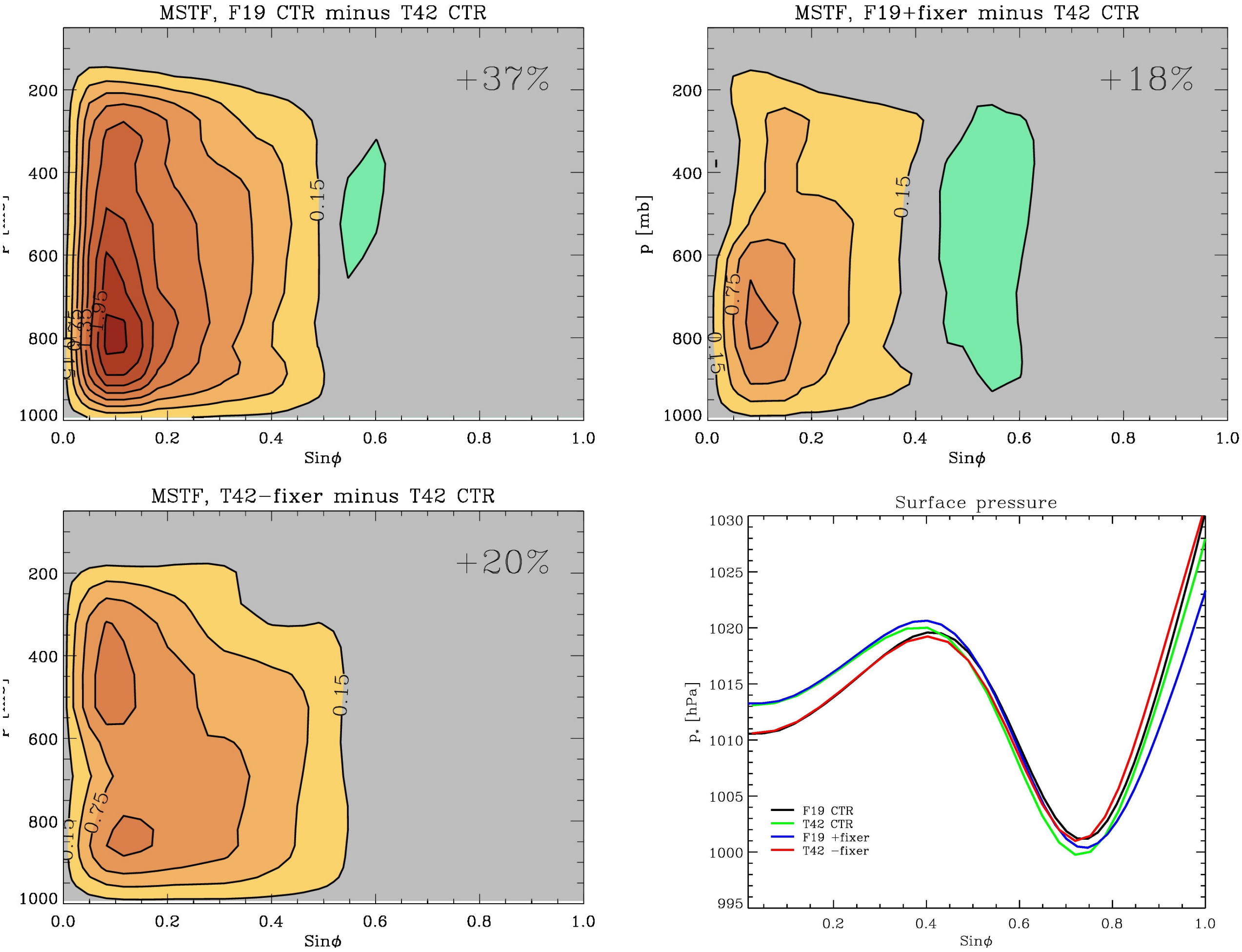


Figure S1: Impact of AM sink in CAM-FV integrations. The three countour plots show the differences in the atmospheric meridional mass streamfunction between the AP simulations shown in Figure 2. The panel on the top-left shows the difference between the control simulation with the FV dynamical core and the simulation with the spectral synamical core. The panel on the upper right shows the difference between the FV simulation with added solid-body rotation increments that compensate for the numerical sink and the control simulation wit the spetral dynamical core. The panel on the bottom left shows the difference between the simulation with the spectral dynamical core and added solid-body rotation increments that emulate the numerical sink of the FV simulation, and the control simulation with the spectral dynamical core. The figures on the top-right of each panel show the differences between the maxima of the streamfunctions in percent. The graph on the lower right is anaolgous to Figure 2, except that it shows the meridional distribution of surface pressure in the four experiments.

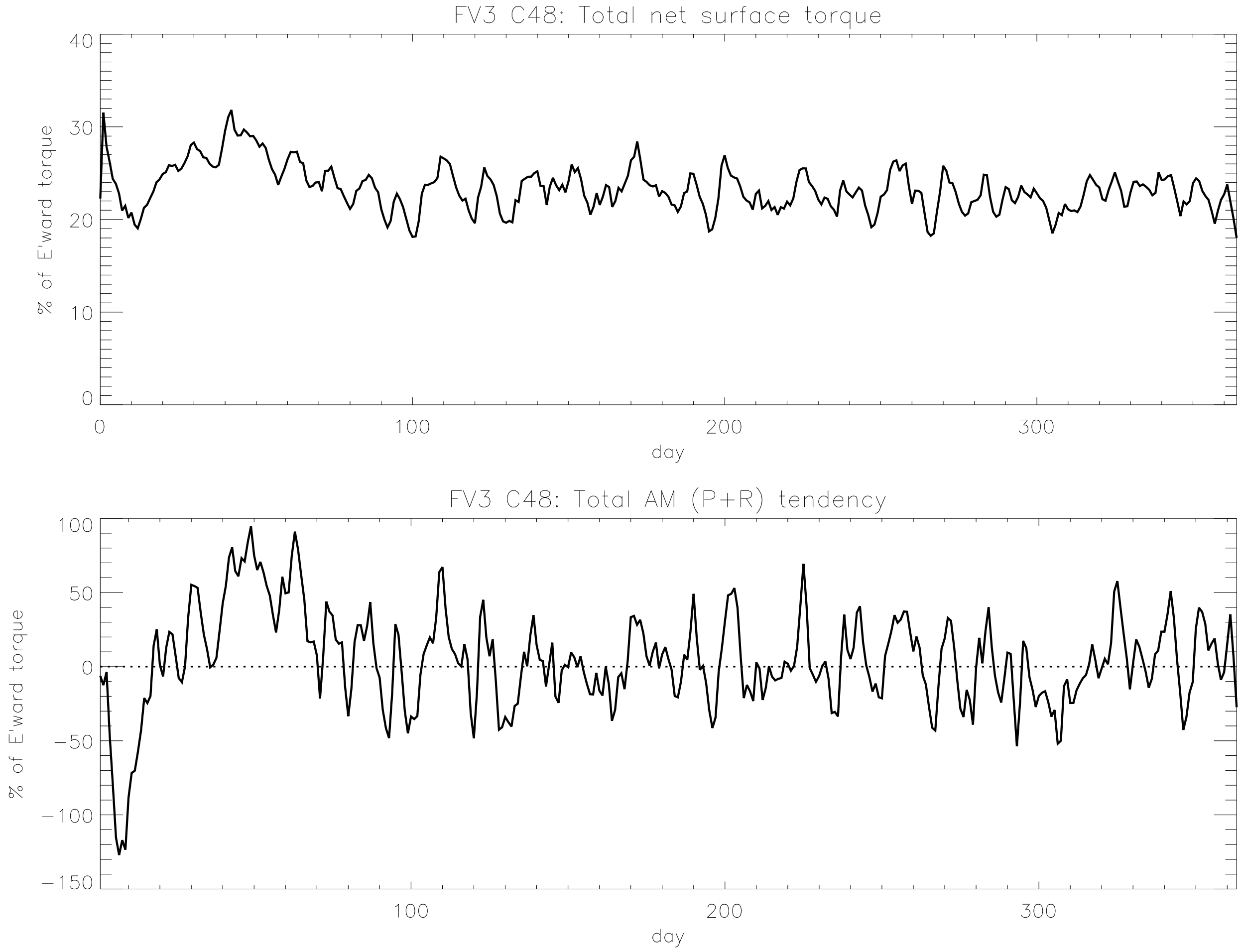


Figure S2: AM sink in CAM-FV3 integrations. Time-series from an AP CAM simulation using the FV dynamical core on a cubed-sphere grid with 48 points for each side of the 6 faces. This resolution is approximately equivalent to the "f19" ($1.9^o \times 2.5^o$) resolution on the regular latitude-longitude grid that was used for most of the other CAM simulations presented in this paper. The upper panel shows the total torque due to surface wind-stress, as a function of time, normalised to the total eastward surface torque (i.e. the torque per unit area integrated over the domain where it is positive), i.e. as a fraction of the physical flux. It can be seen that the global torque remains positive at about 25% of the physical flux, a level smaller but comparable with the standard f19 simulation (cf. Table 1). The lower panel shows the time evolution of the total atmospheric AM, which does not increase in time in spite of the torque that is acting on the atmosphere. This implies a compensating numerical torque in this simulation.

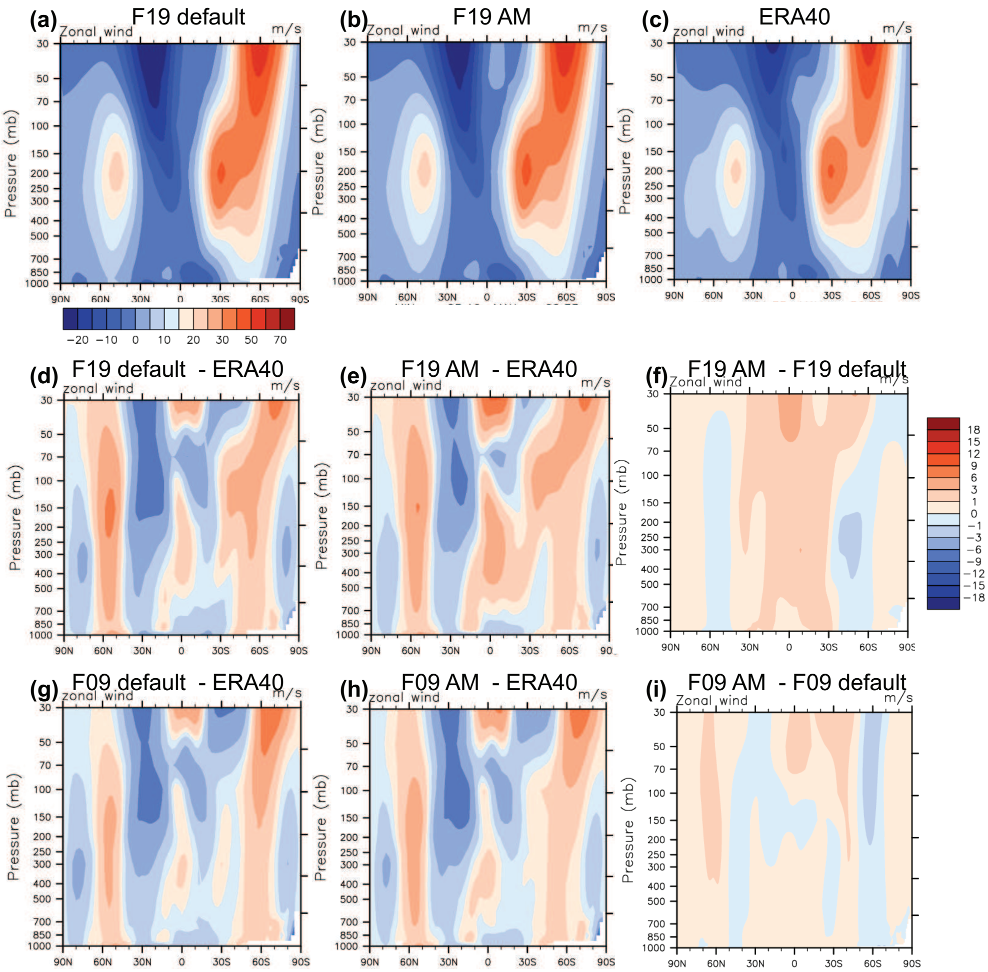


Figure S3: Impact of AM correction and fixer in F2000 simulations. Same as Figure 10, but for boreal Summer (JJA).

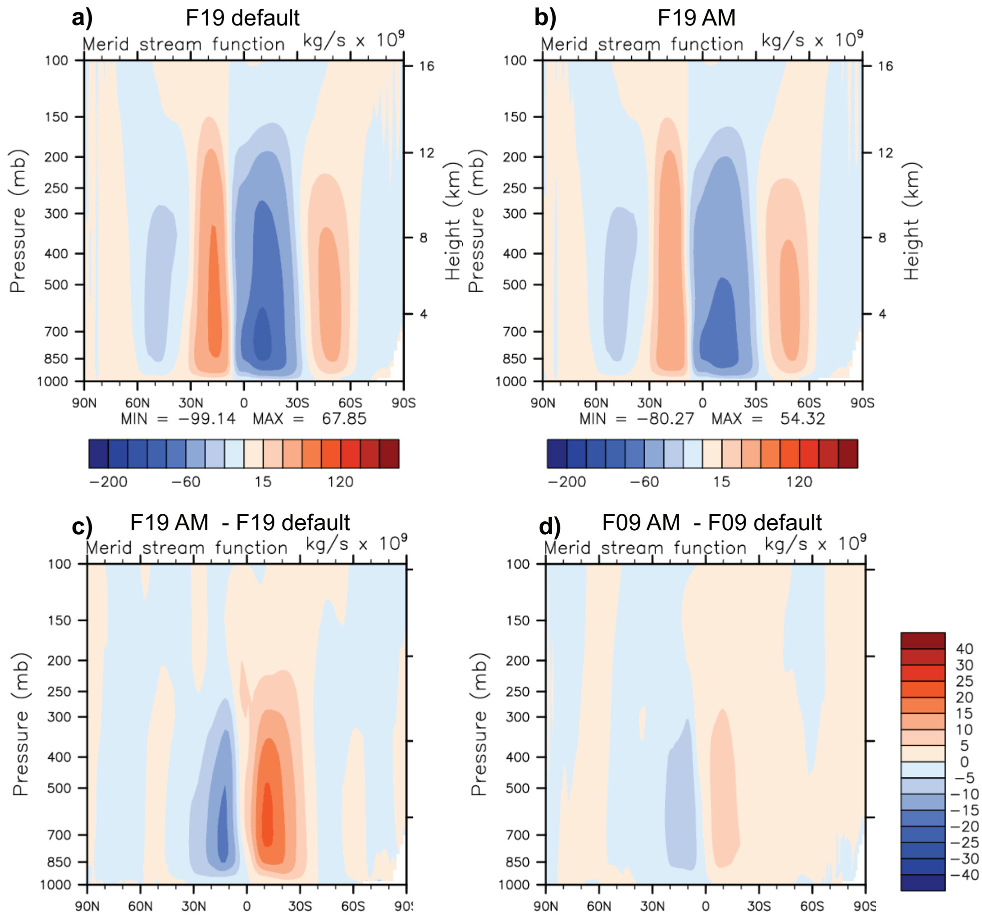


Figure S4: Impact of AM correction and fixer in F2000 simulations. Atmospheric meridional mass streamfunction (MMSTF) in the F2000 simulations shown in Figures 9, 10 and 11. Panel (a) shows the MMSTF in the f19 control simulation, and panel (b) in the f19 simulation using both the AM correction and the AM fixer. Panel (c) shows the difference between the two. Panel (d) shows the same difference but for he simulations at higher, $0.9^o \times 1.25^o$ resolution.