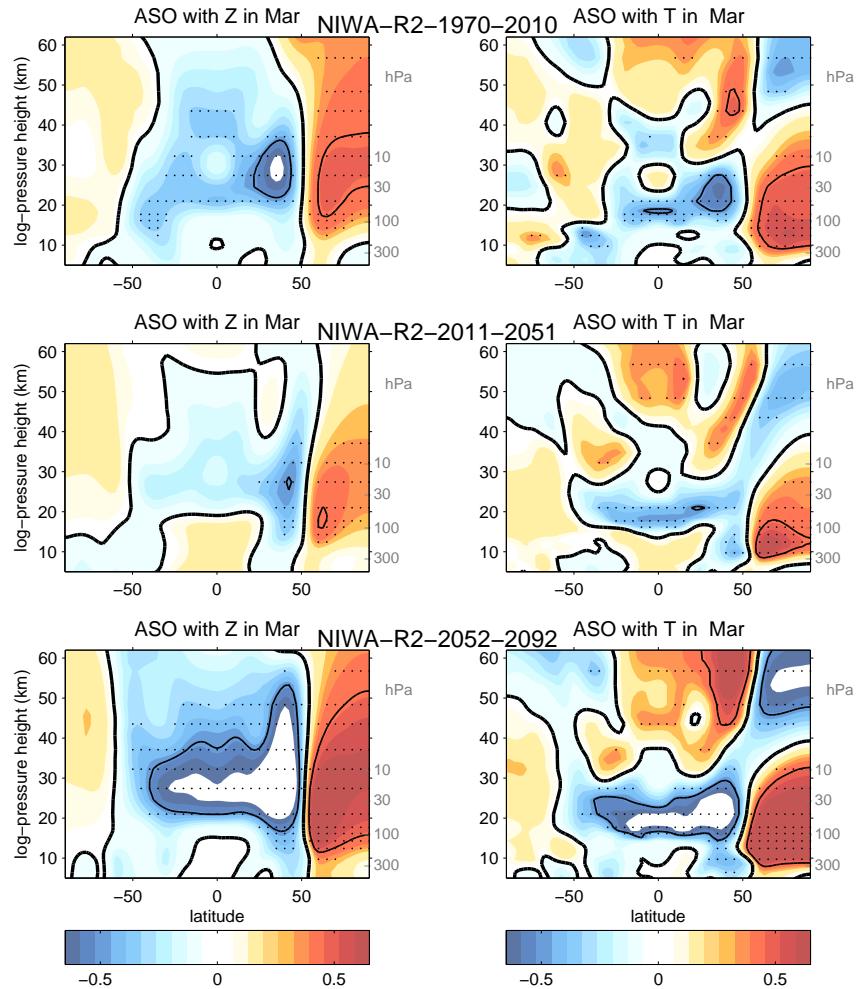
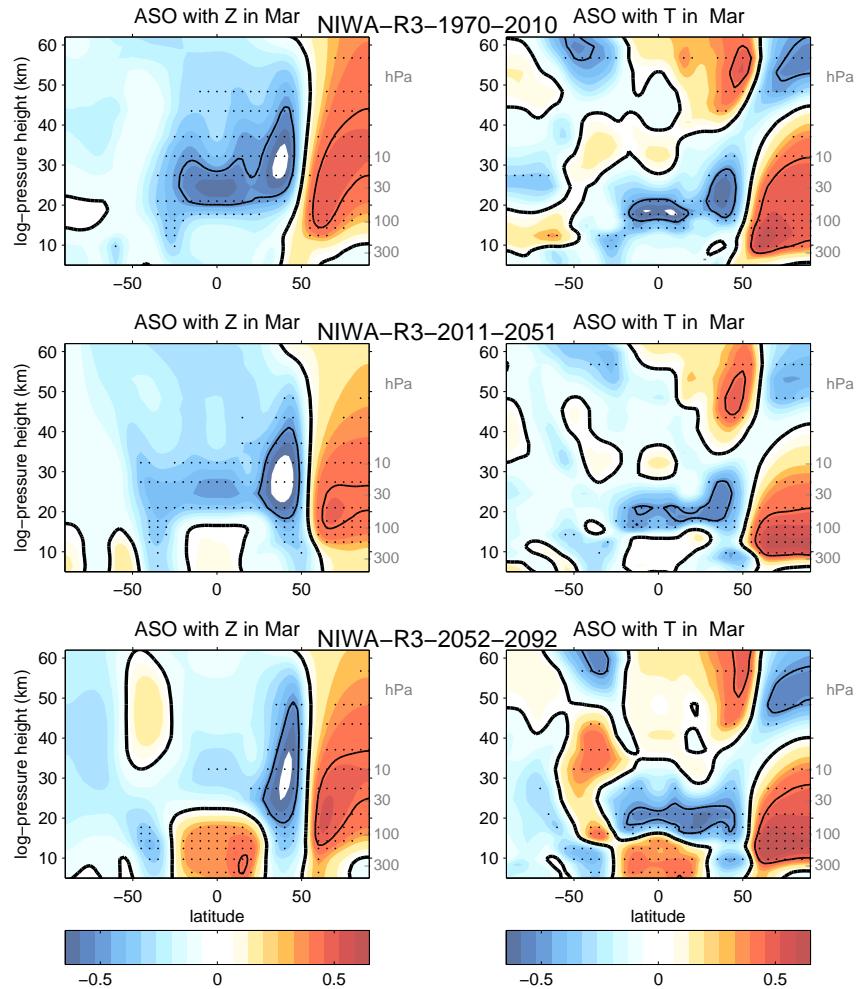


**Fig. S 1.** As in figure 2 of main body, but for Niwa run #1

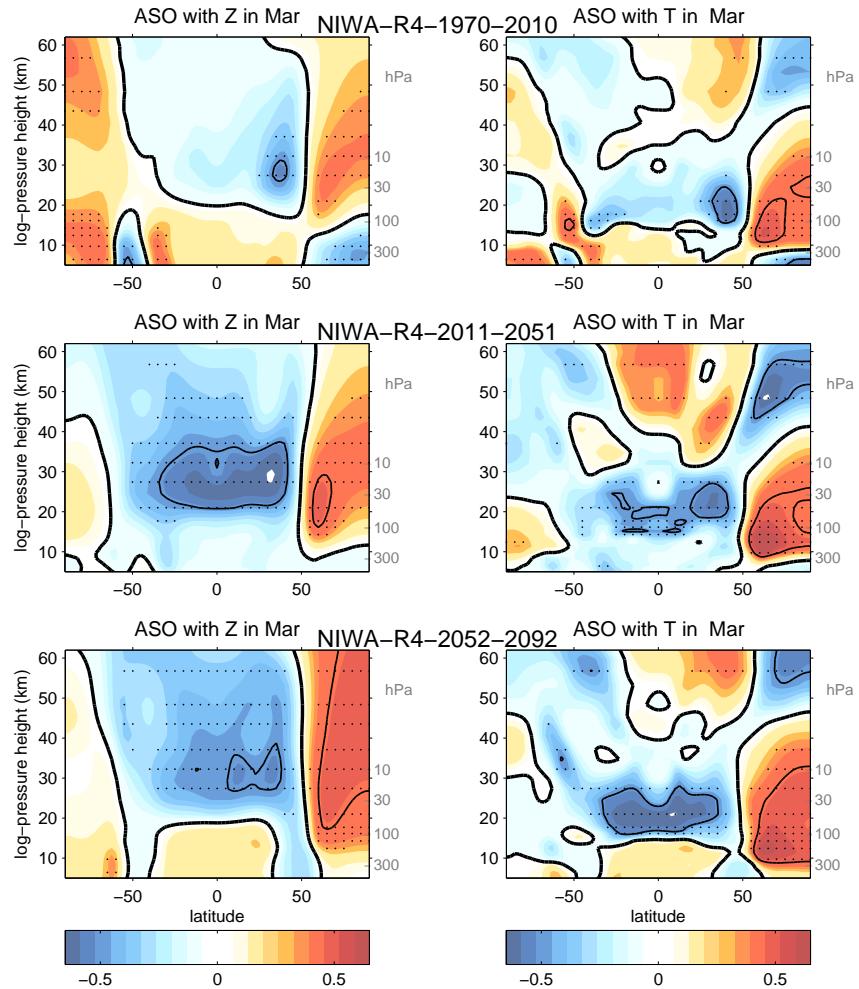
## 1 Influence of Arctic Stratospheric Ozone on Surface Climate in CCM1 models



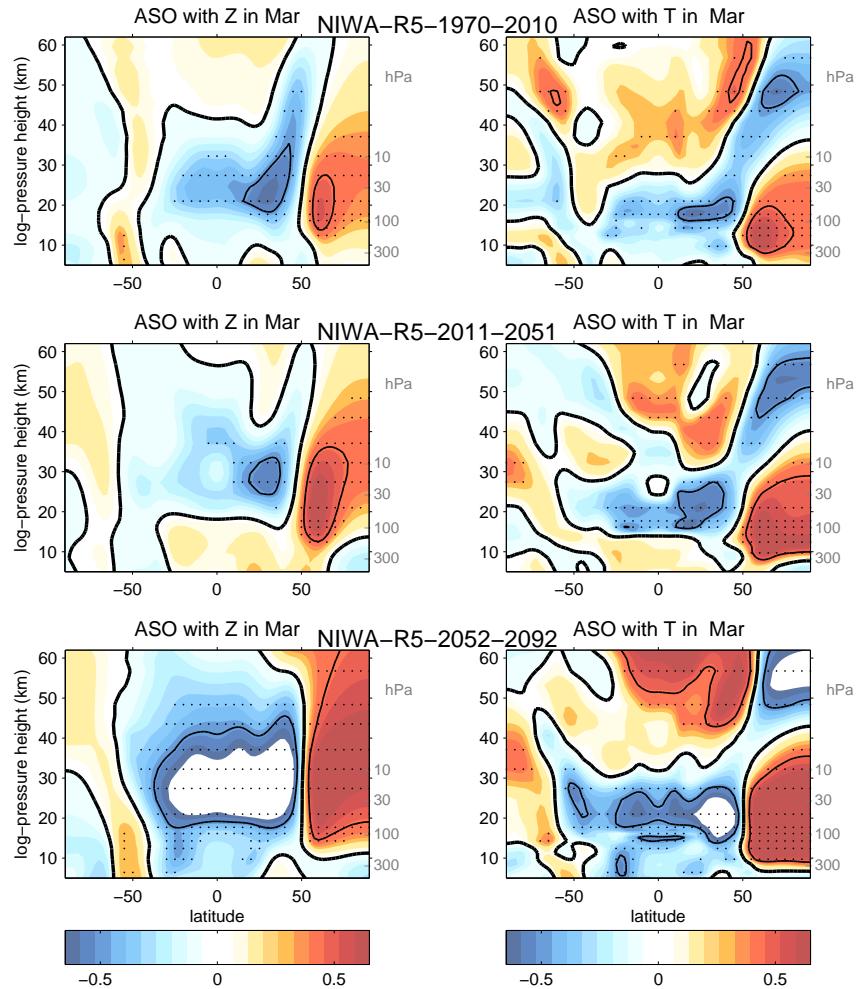
**Fig. S 2.** As in figure 2 of main body, but for Niwa run #2



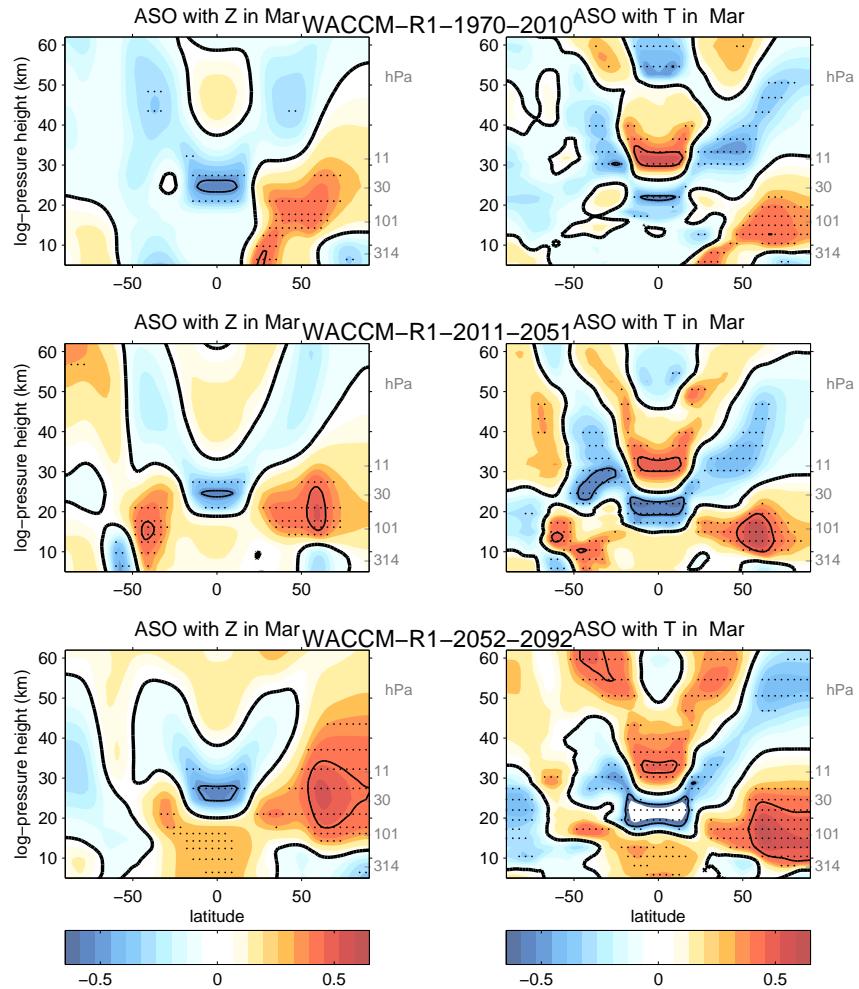
**Fig. S 3.** As in figure 2 of main body, but for Niwa run #3



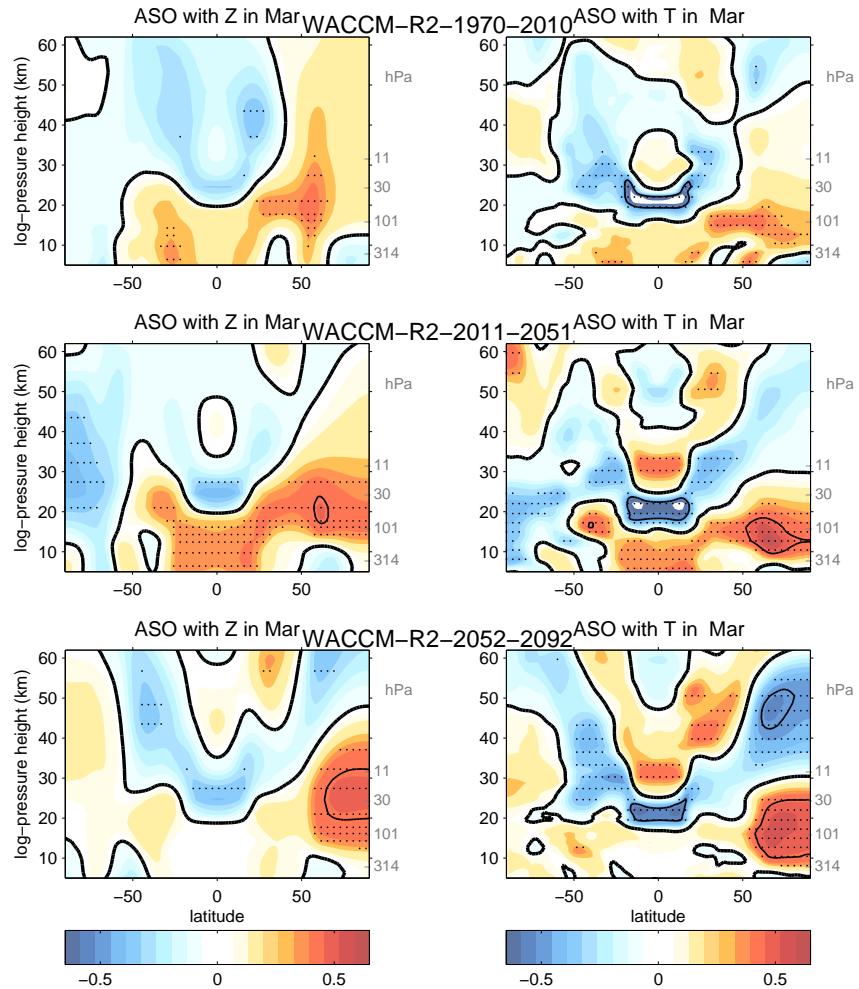
**Fig. S 4.** As in figure 2 of main body, but for Niwa run #4



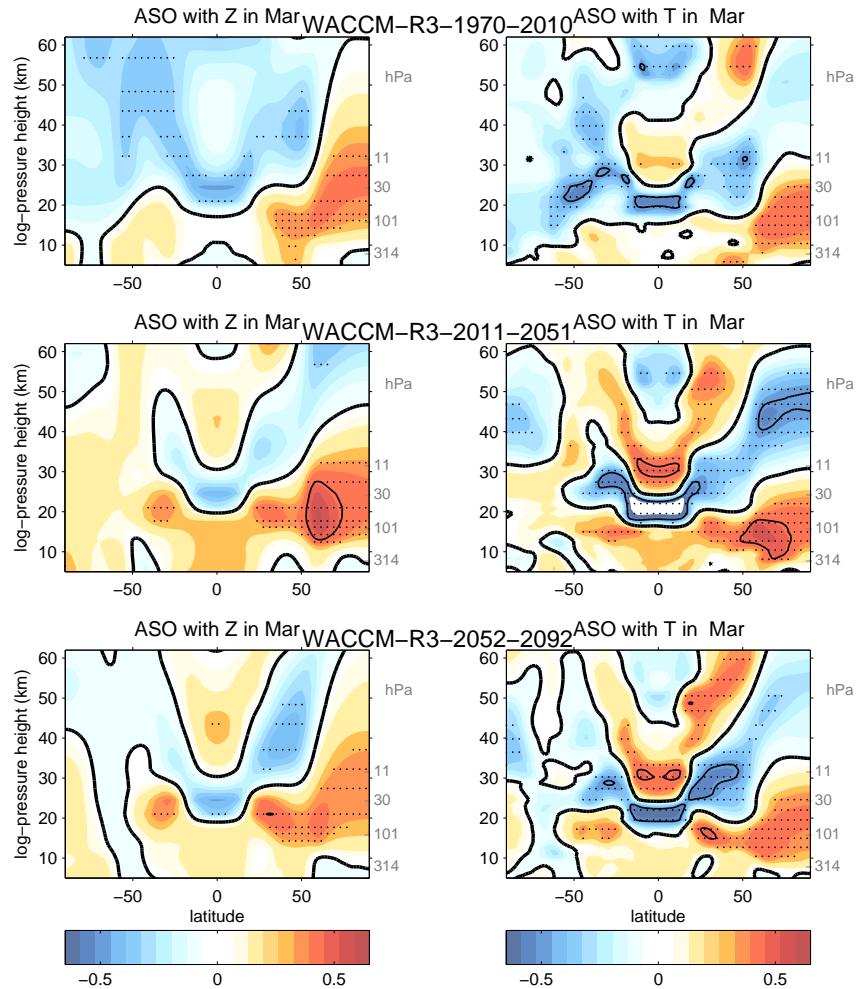
**Fig. S 5.** As in figure 2 of main body, but for Niwa run #5



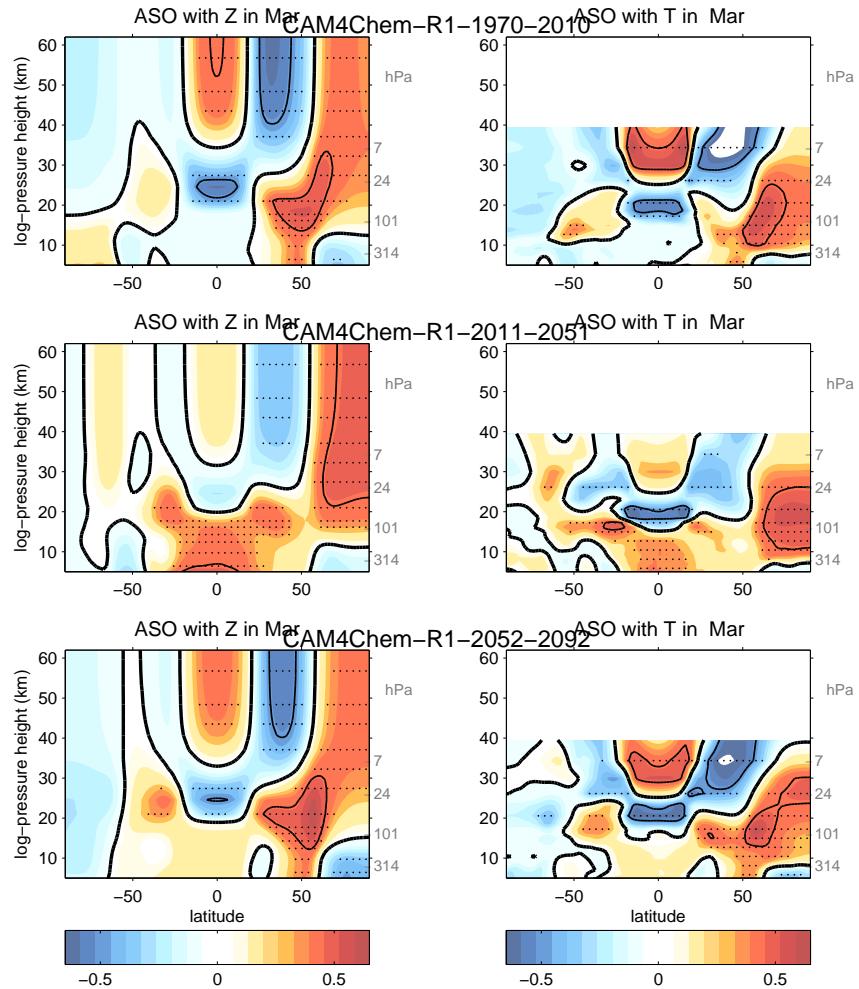
**Fig. S 6.** As in figure 2 of main body, but for NCAR-WACCM run #1



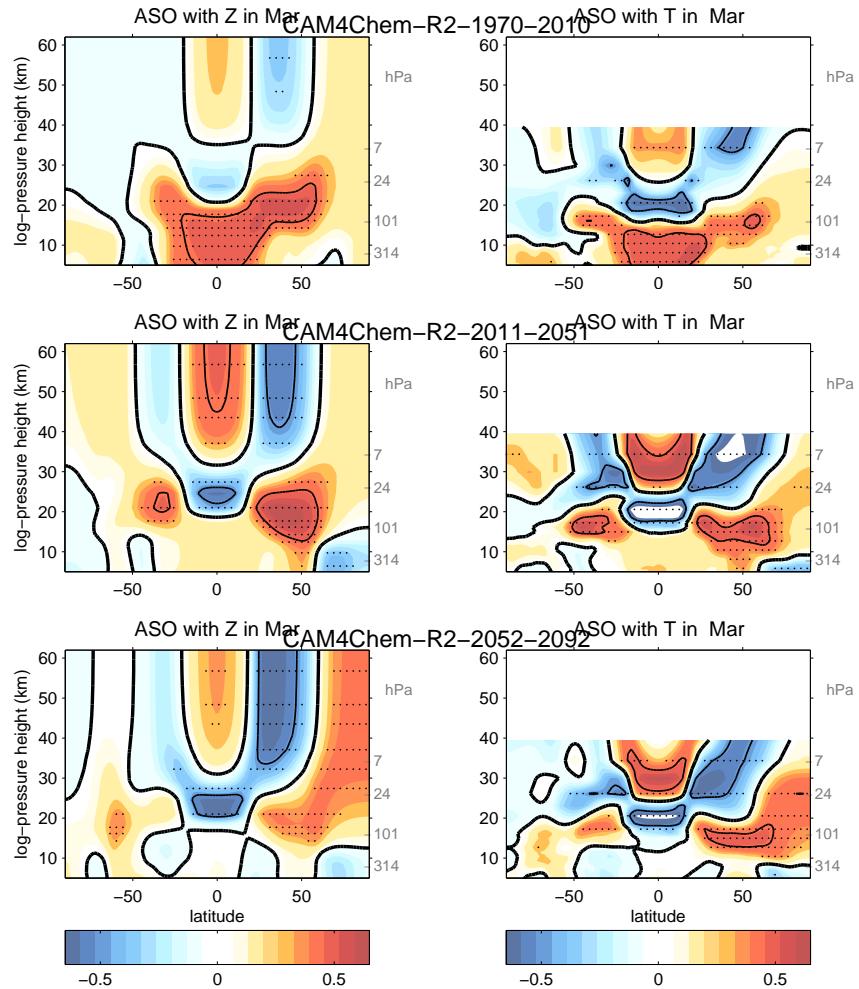
**Fig. S 7.** As in figure 2 of main body, but for NCAR-WACCM run #2



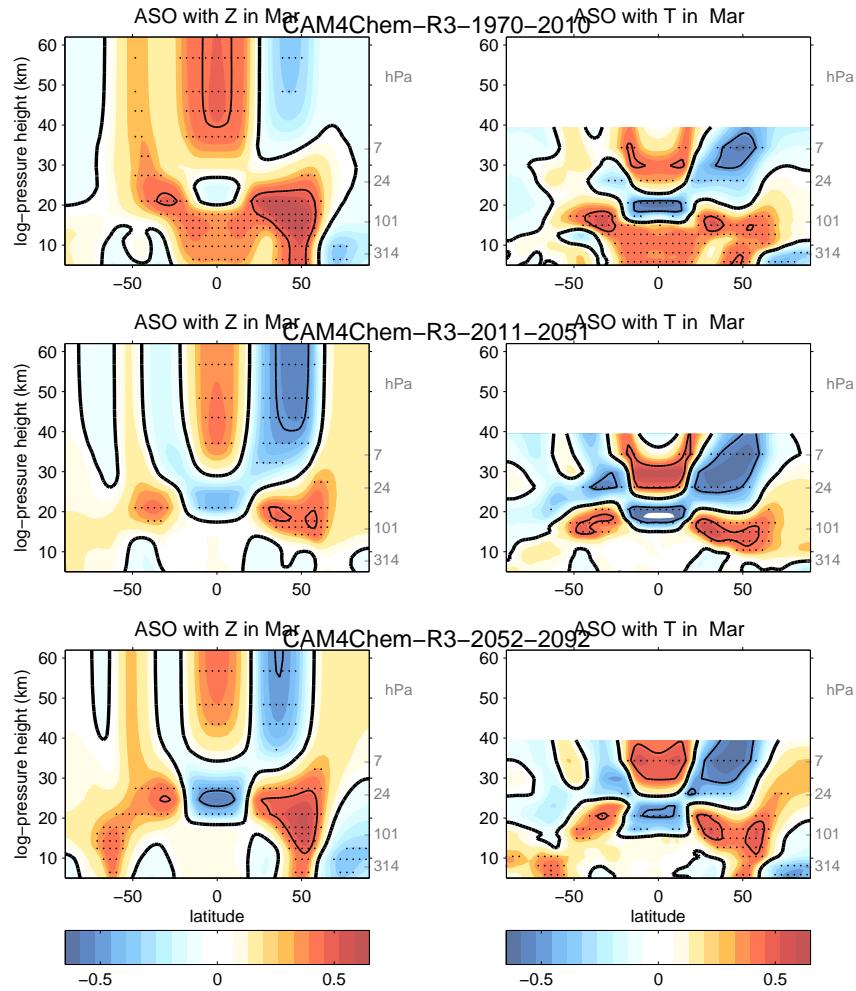
**Fig. S 8.** As in figure 2 of main body, but for NCAR-WACCM run #3



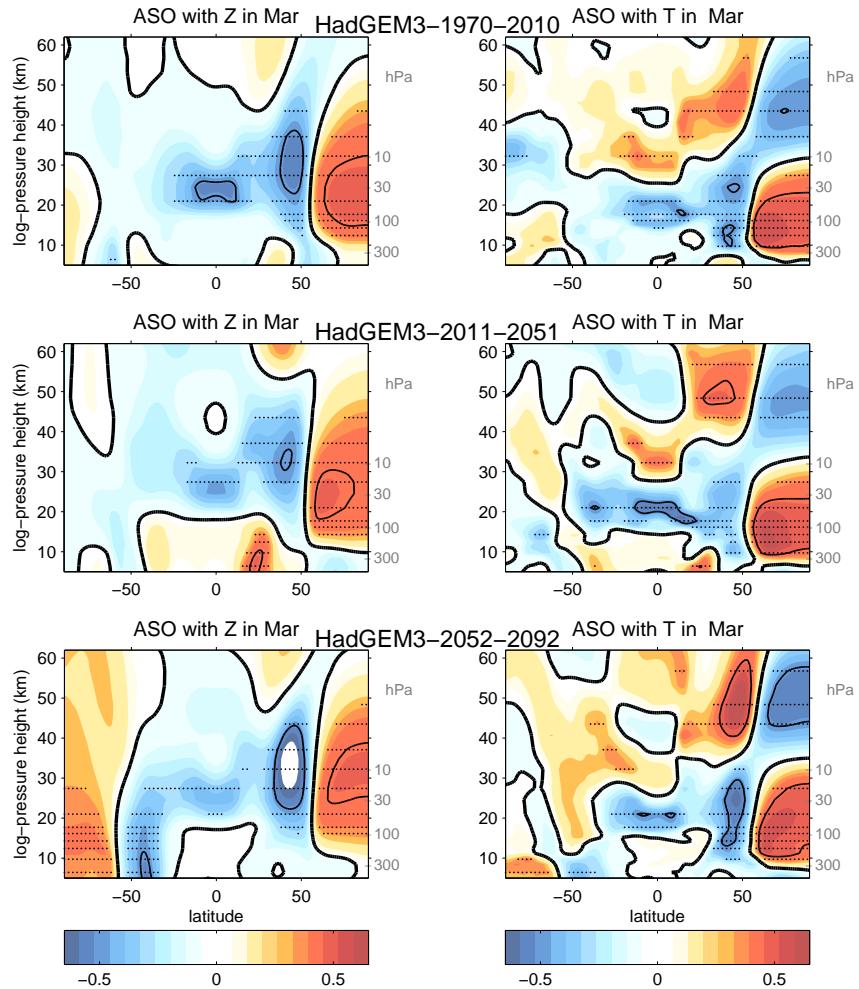
**Fig. S 9.** As in figure 2 of main body, but for NCAR-CAM4Chem run #1



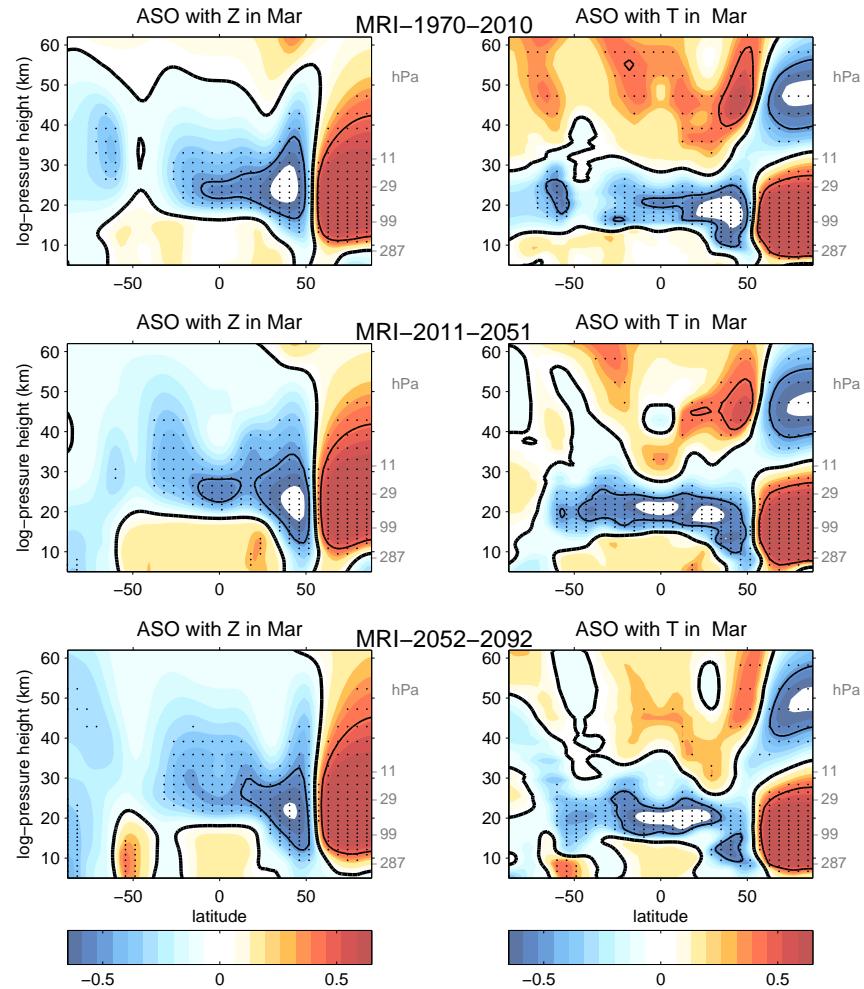
**Fig. S 10.** As in figure 2 of main body, but for NCAR-CAM4Chem run #2



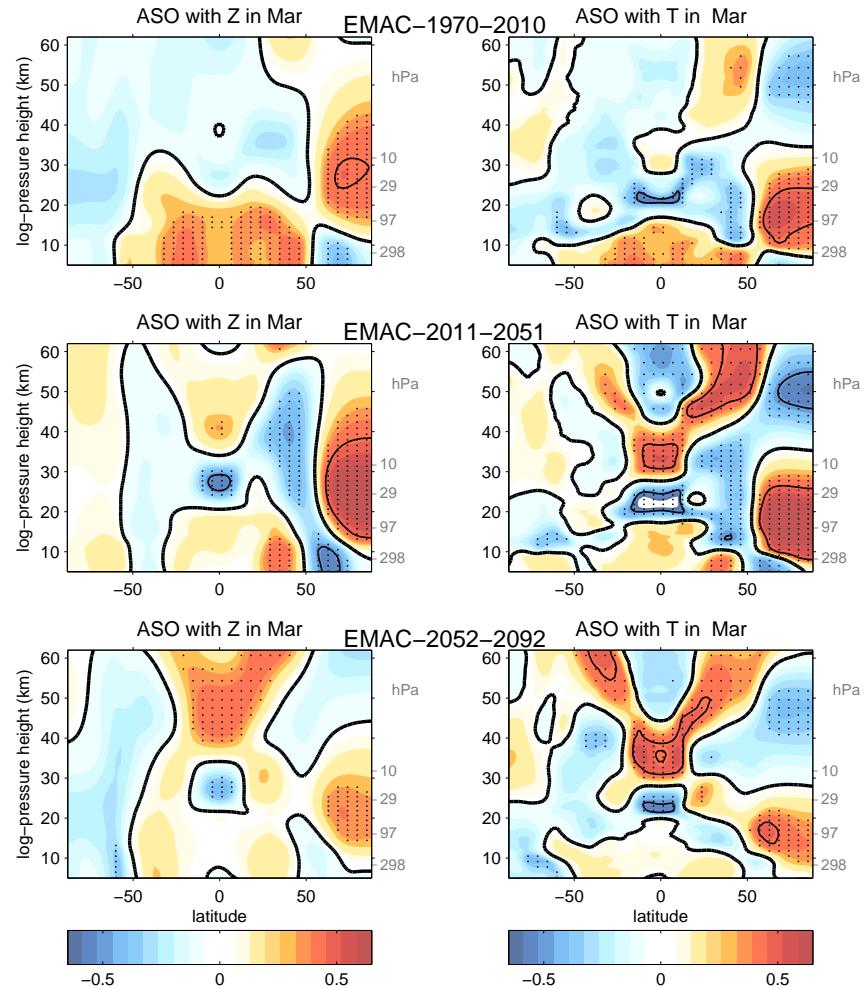
**Fig. S 11.** As in figure 2 of main body, but for NCAR-CAM4Chem run #3



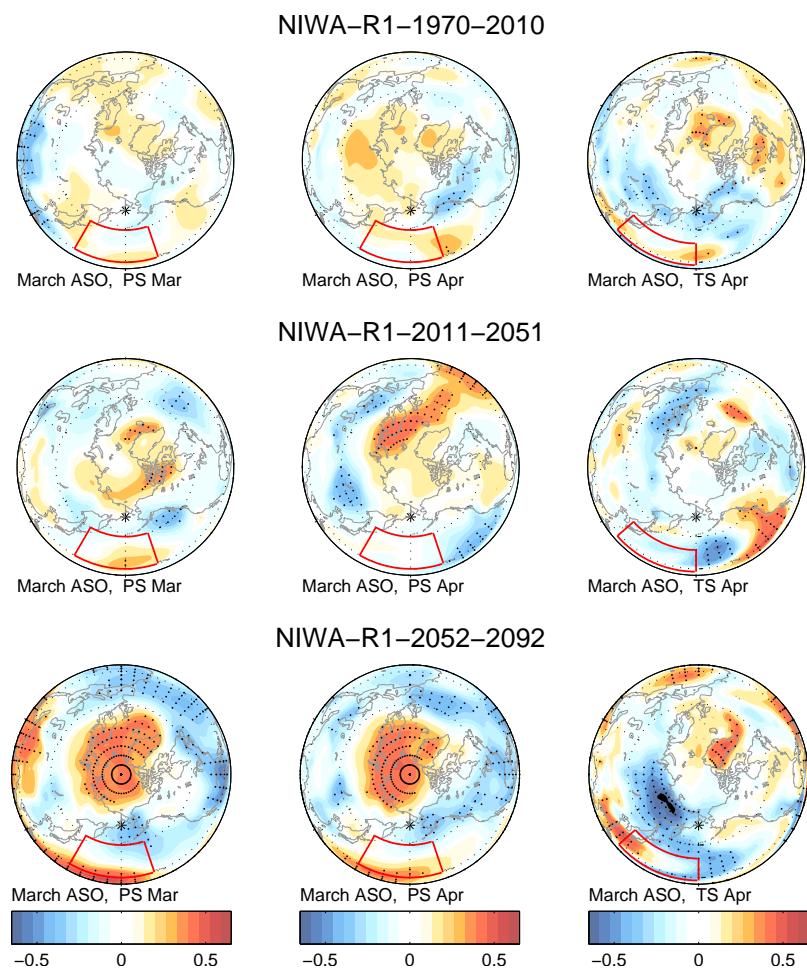
**Fig. S 12.** As in figure 2 of main body, but for HadGEM



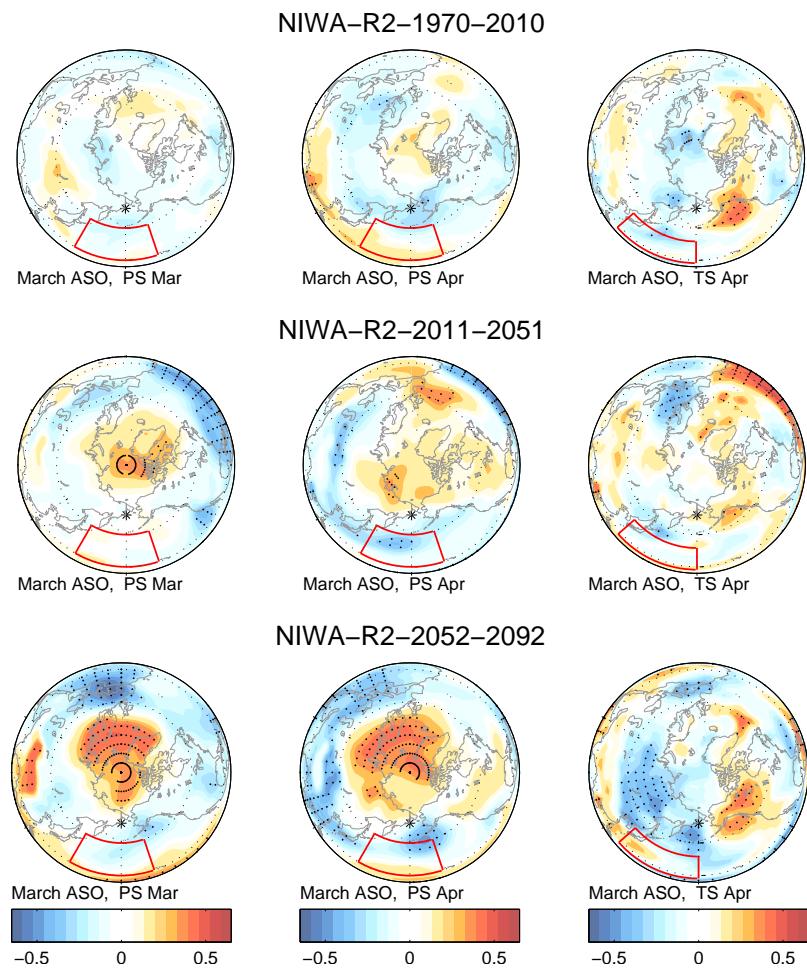
**Fig. S 13.** As in figure 2 of main body, but for MRI



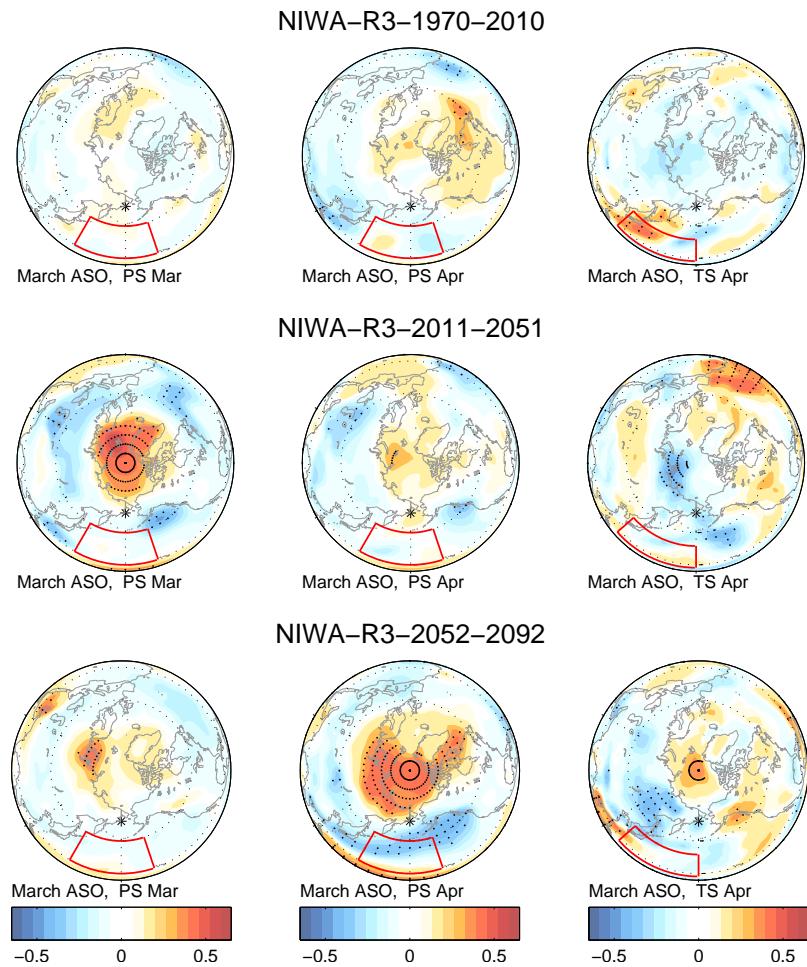
**Fig. S 14.** As in figure 2 of main body, but for EMAC



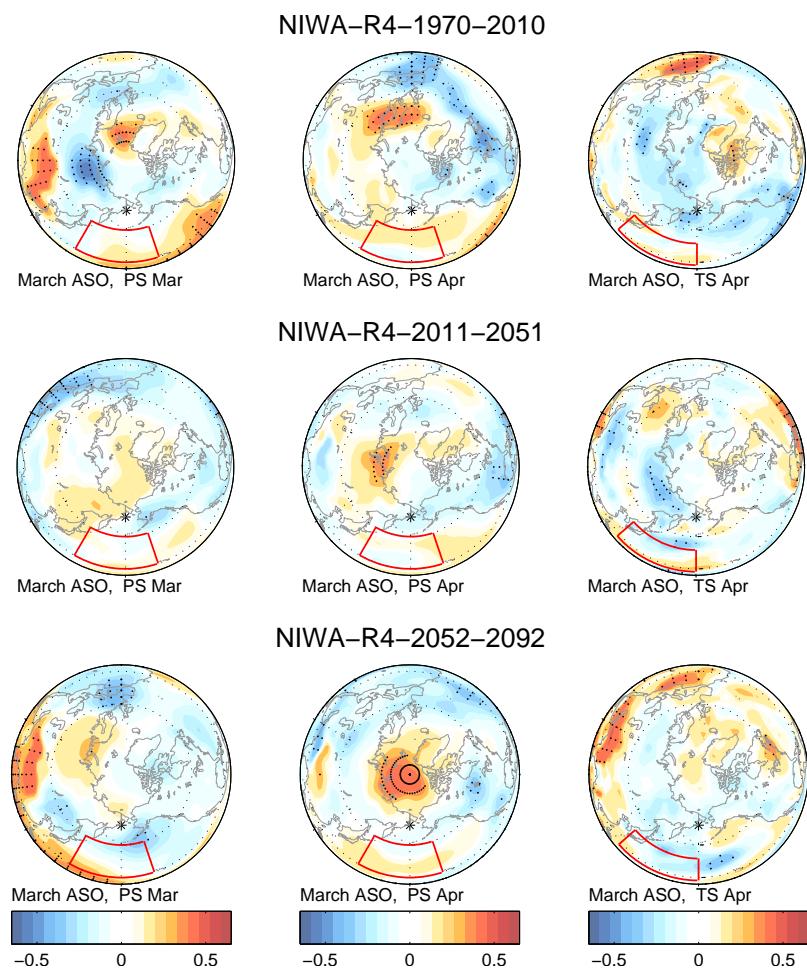
**Fig. S 15.** As in figure 5 of main body, but for Niwa run #1



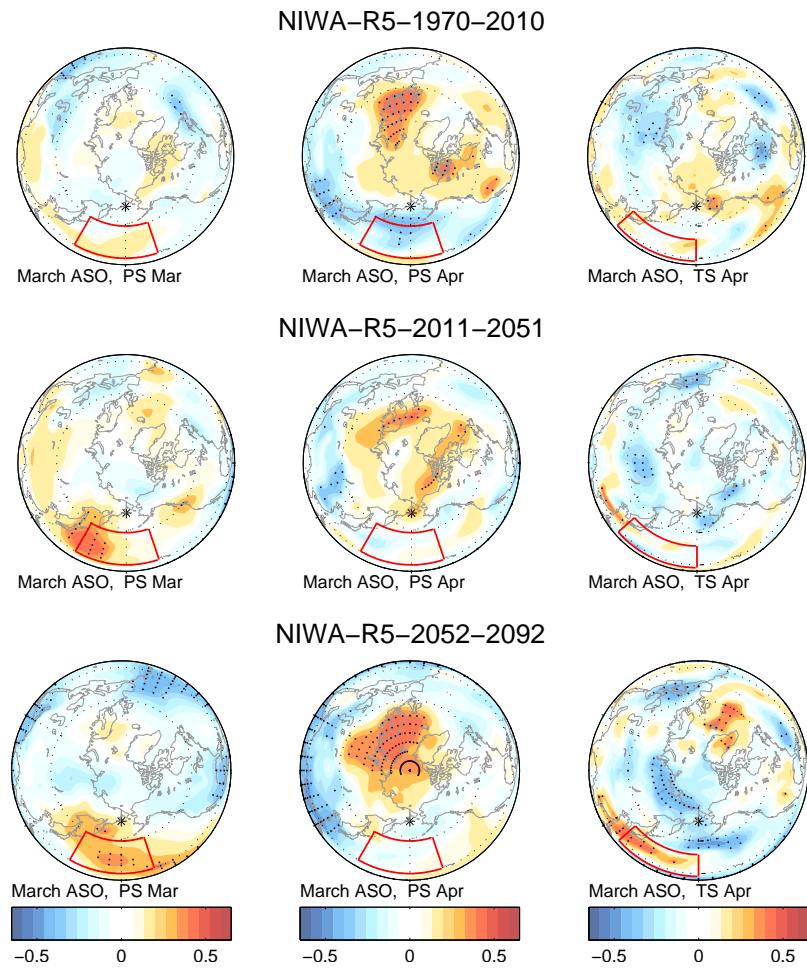
**Fig. S 16.** As in figure 5 of main body, but for Niwa run #2



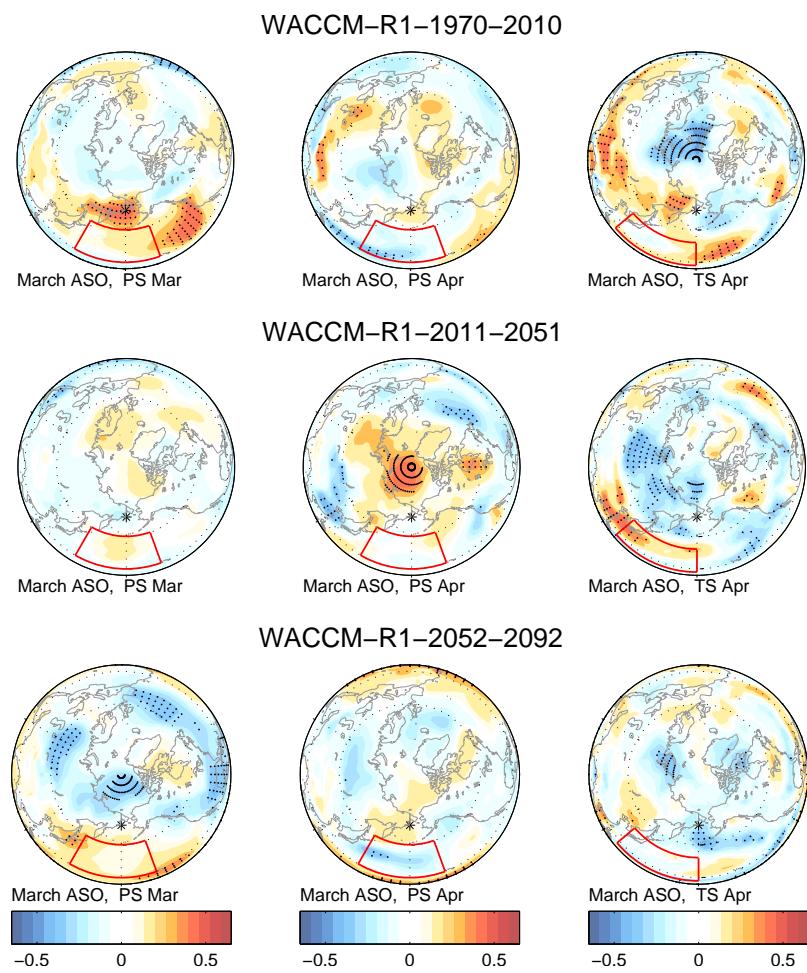
**Fig. S 17.** As in figure 5 of main body, but for Niwa run #3



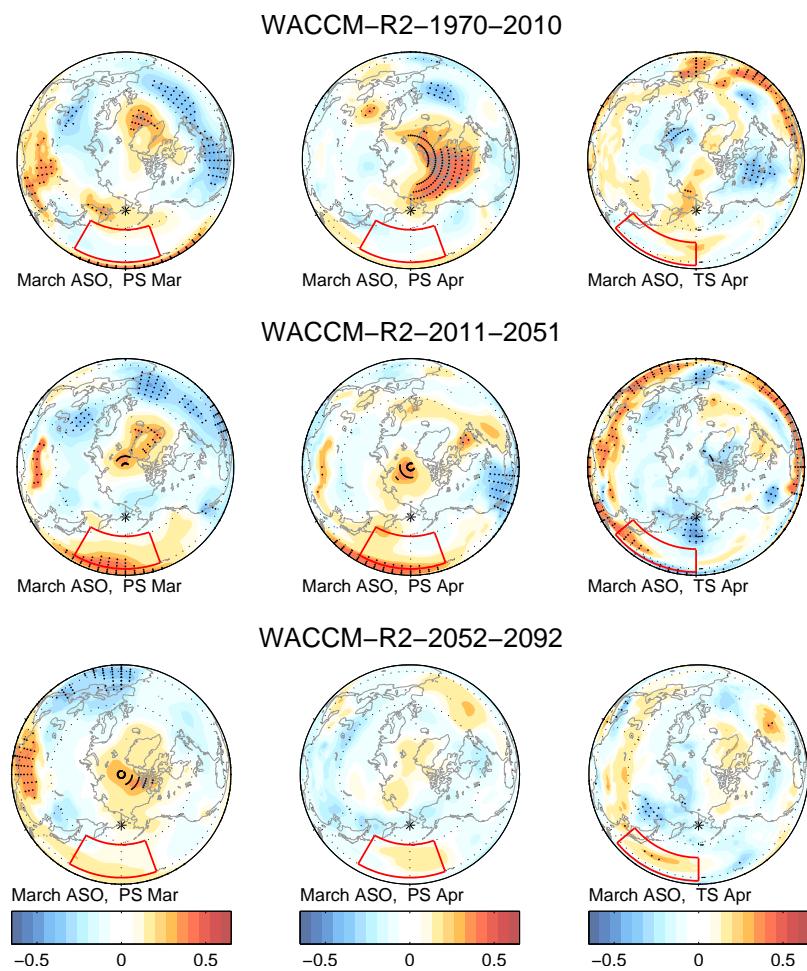
**Fig. S 18.** As in figure 5 of main body, but for Niwa run #4



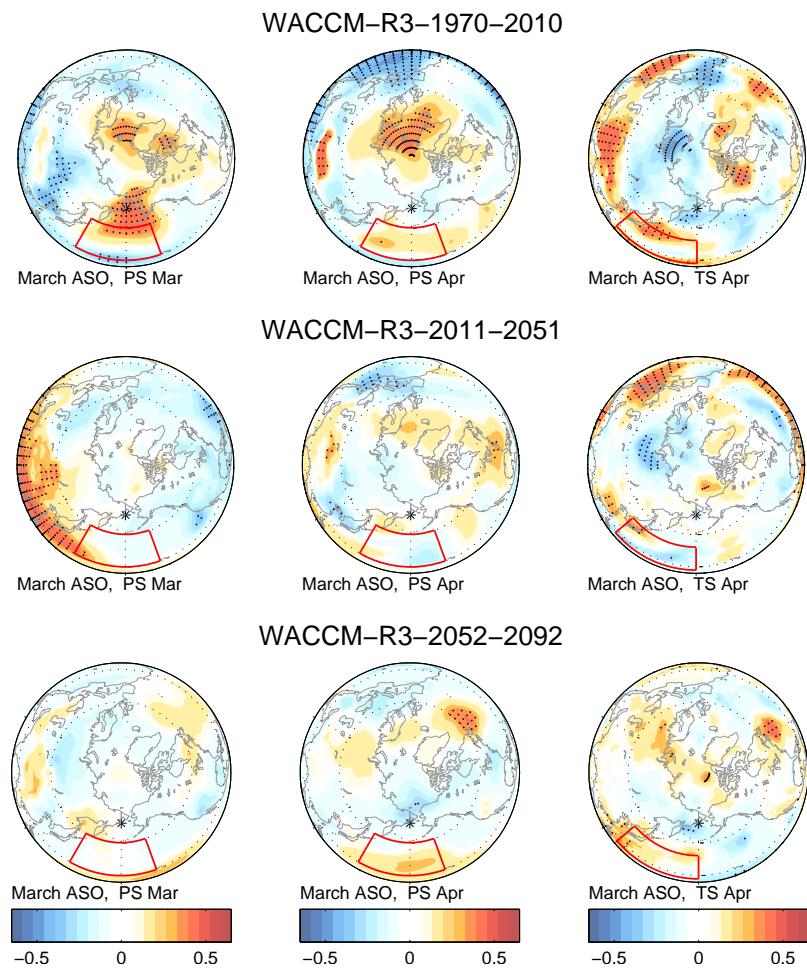
**Fig. S 19.** As in figure 5 of main body, but for Niwa run #5



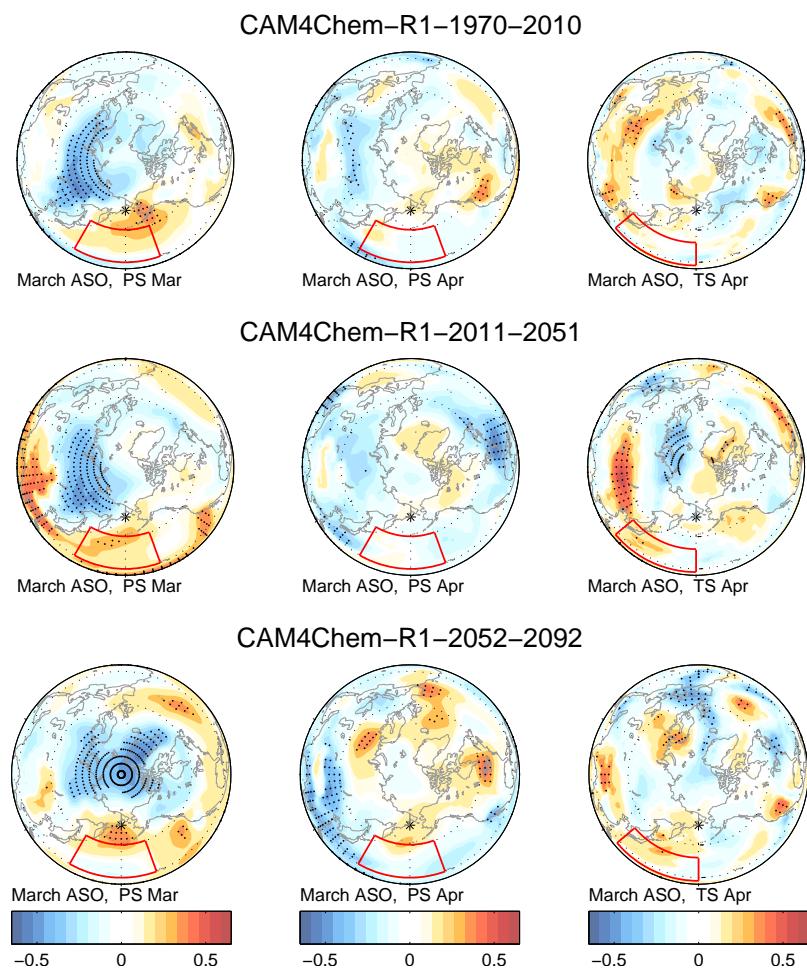
**Fig. S 20.** As in figure 5 of main body, but for NCAR-WACCM run #1



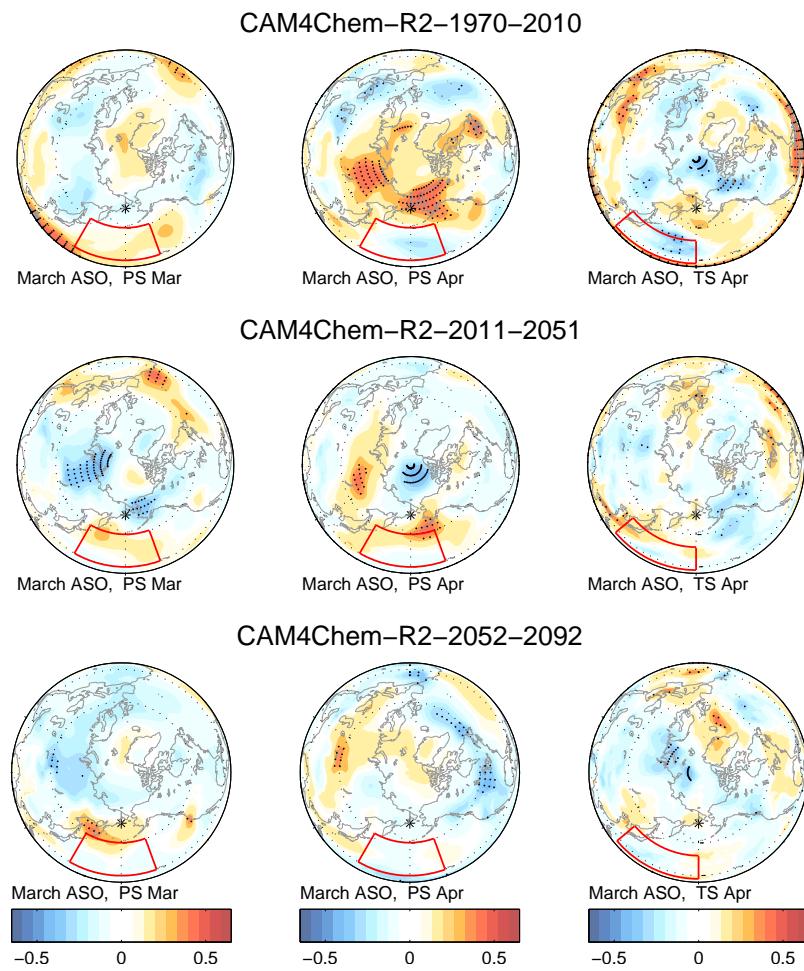
**Fig. S 21.** As in figure 5 of main body, but for NCAR-WACCM run #2



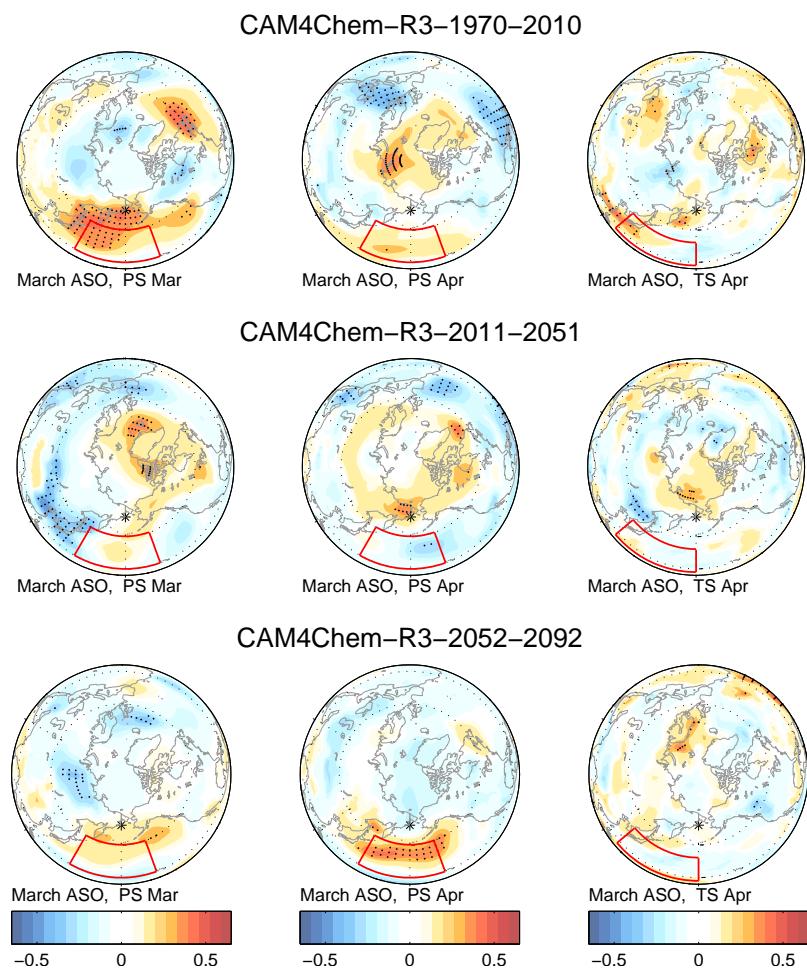
**Fig. S 22.** As in figure 5 of main body, but for NCAR-WACCM run #3



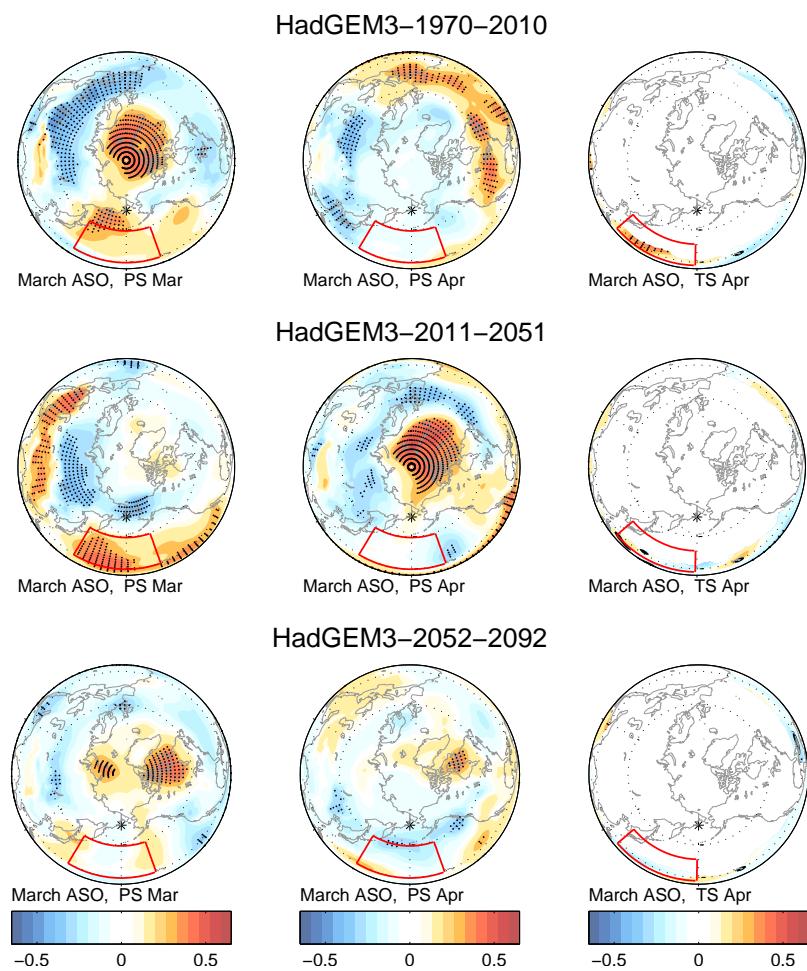
**Fig. S 23.** As in figure 5 of main body, but for NCAR-CAM4Chem run #1



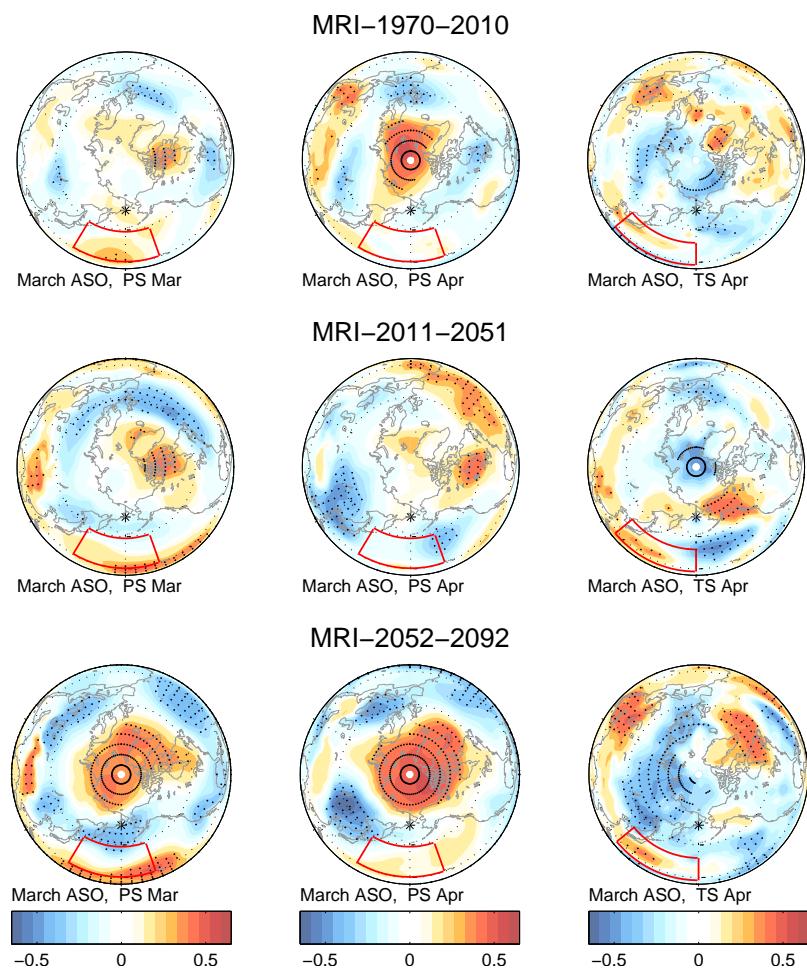
**Fig. S 24.** As in figure 5 of main body, but for NCAR-CAM4Chem run #2



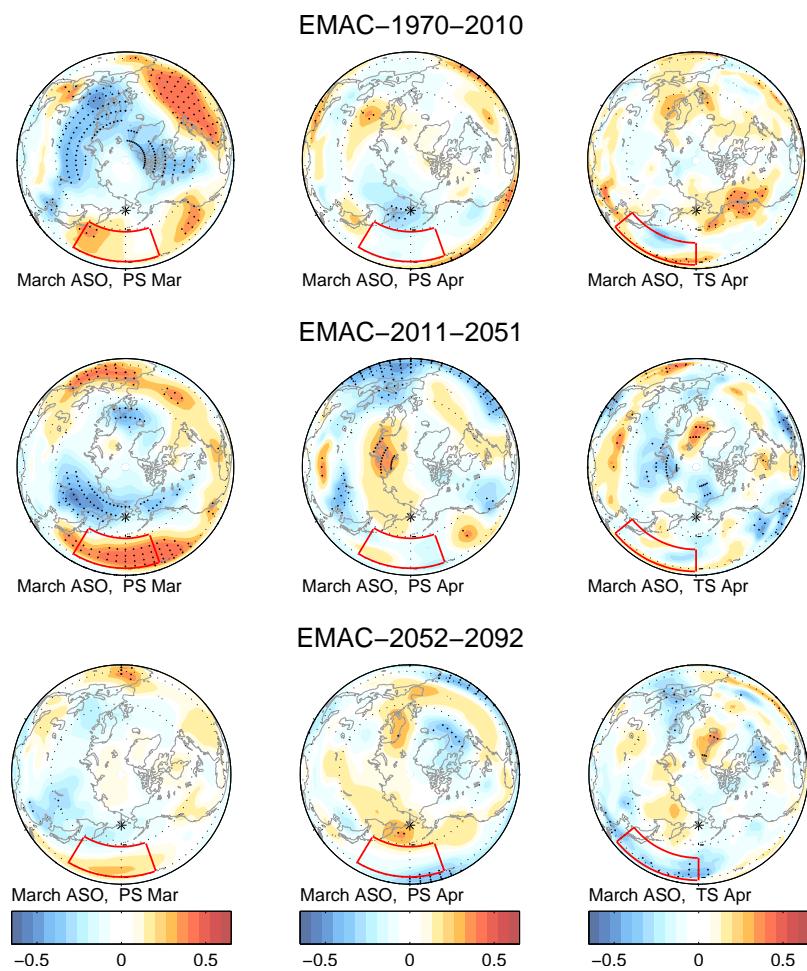
**Fig. S 25.** As in figure 5 of main body, but for NCAR-CAM4Chem run #3



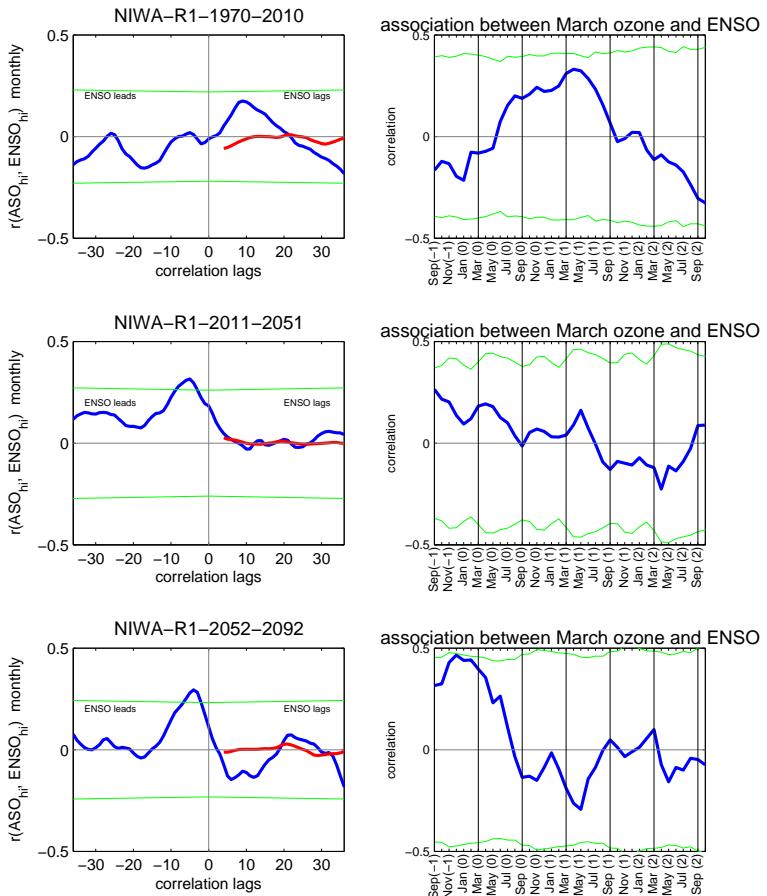
**Fig. S 26.** As in figure 5 of main body, but for HadGEM



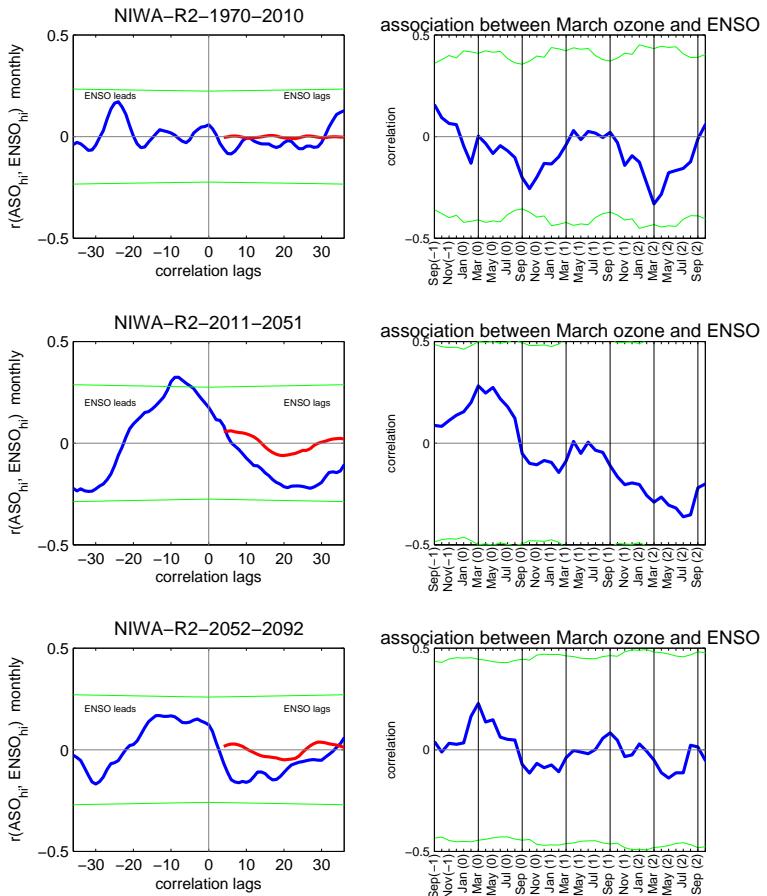
**Fig. S 27.** As in figure 5 of main body, but for MRI



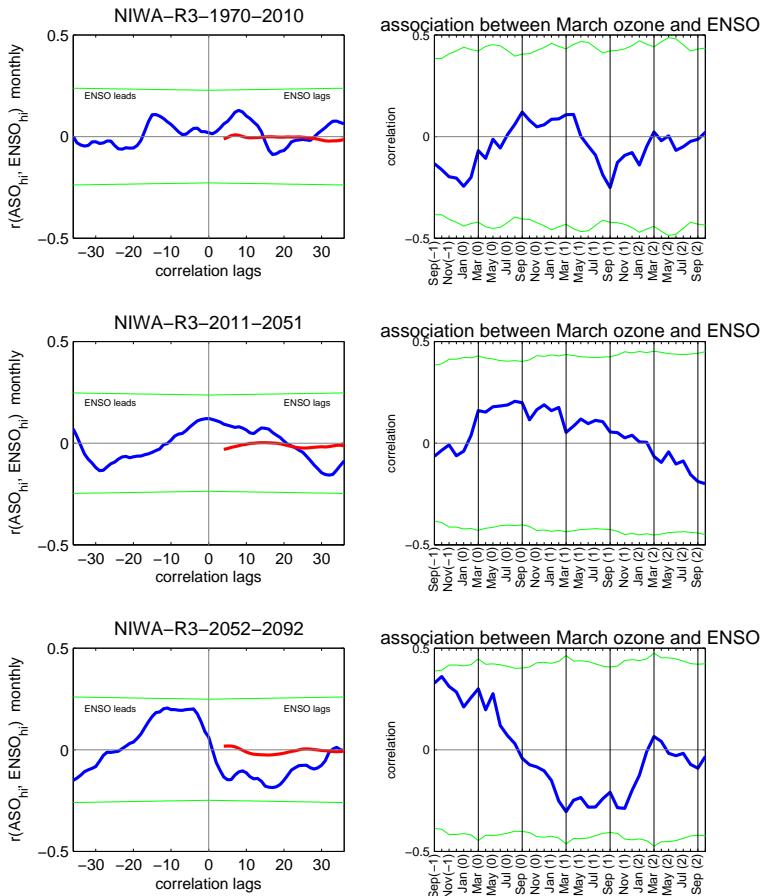
**Fig. S 28.** As in figure 5 of main body, but for EMAC



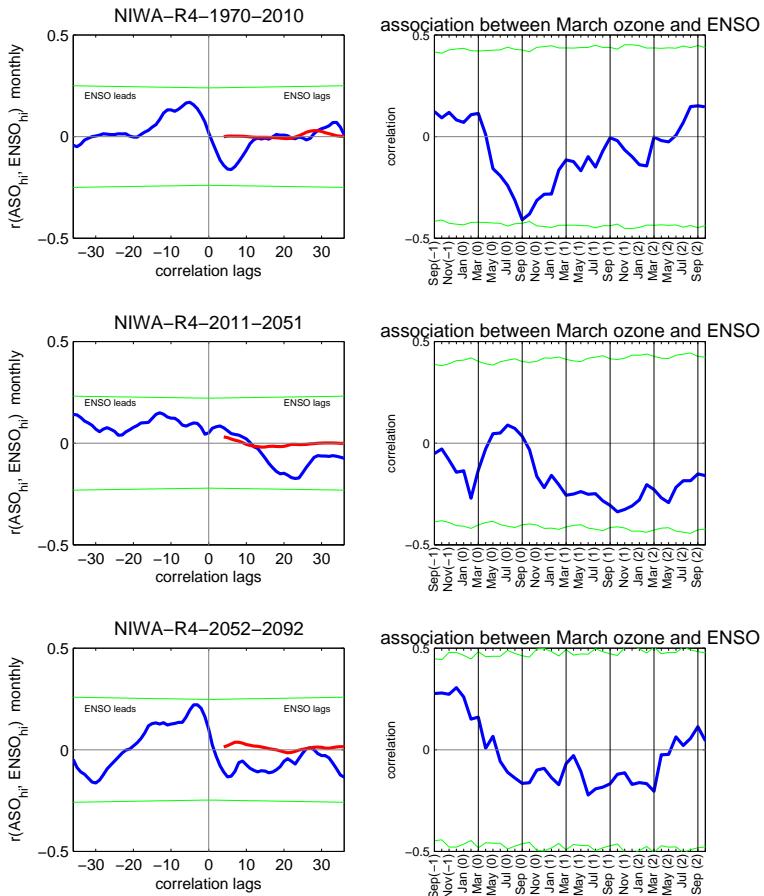
**Fig. S 29.** As in figure 6 of main body, but for Niwa run #1



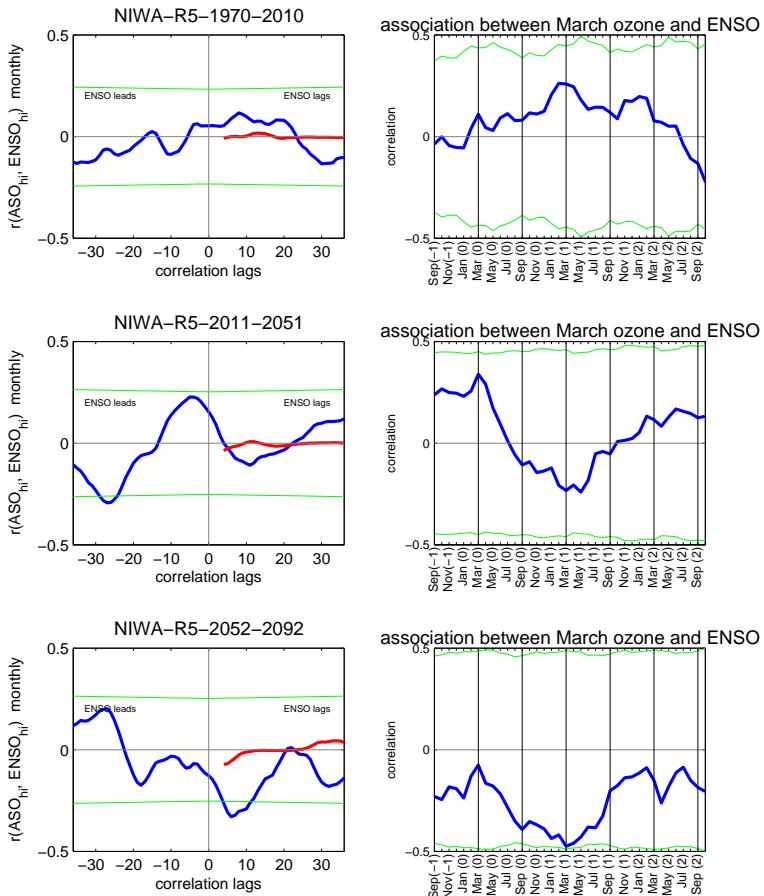
**Fig. S 30.** As in figure 6 of main body, but for Niwa run #2



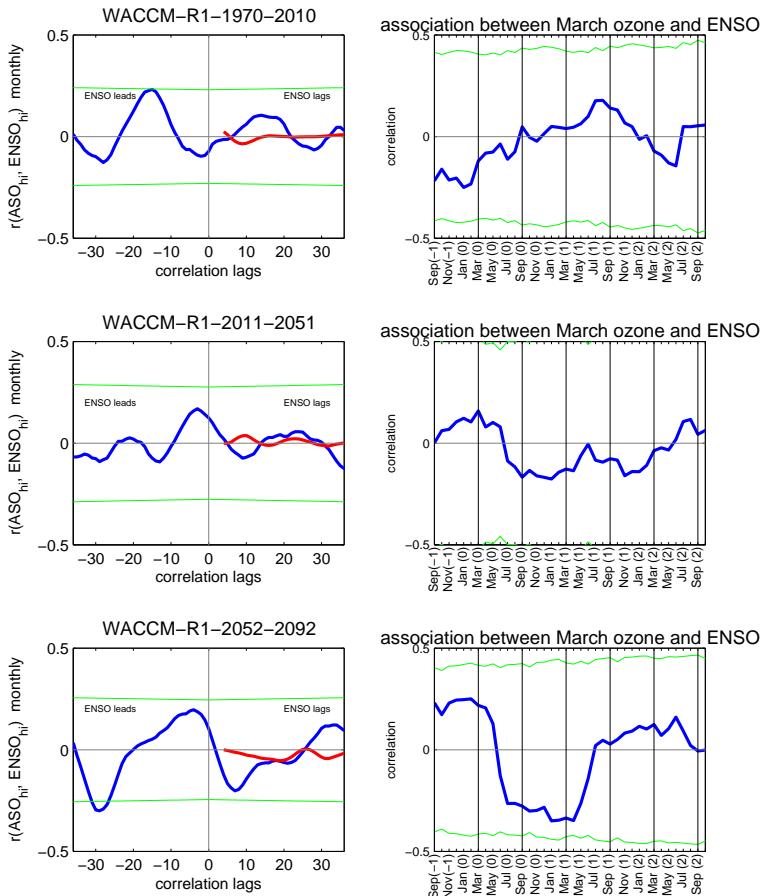
**Fig. S 31.** As in figure 6 of main body, but for Niwa run #3



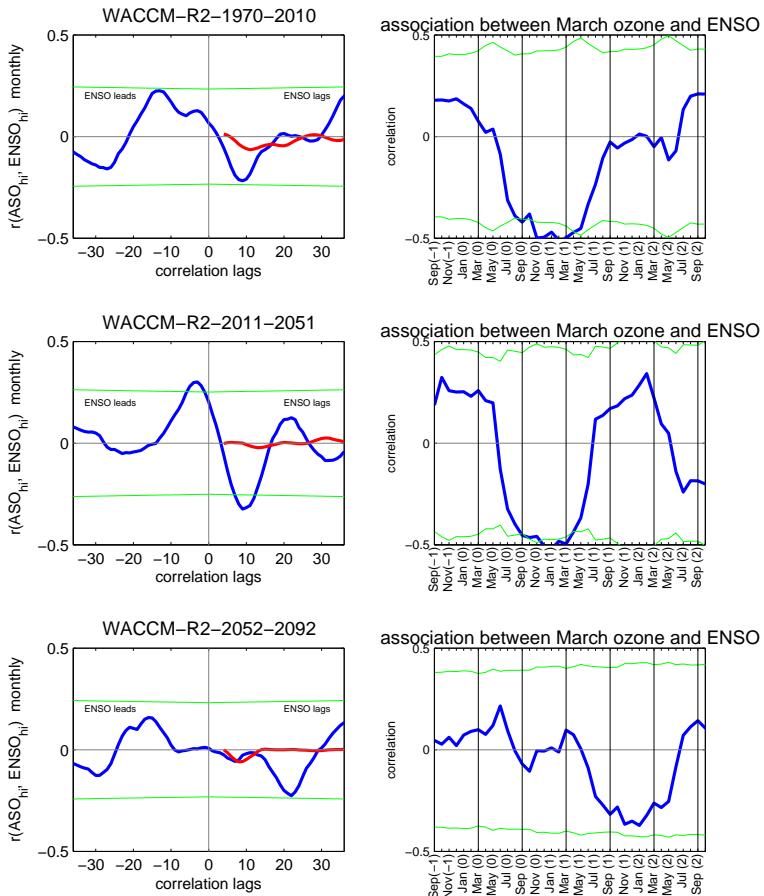
**Fig. S 32.** As in figure 6 of main body, but for Niwa run #4



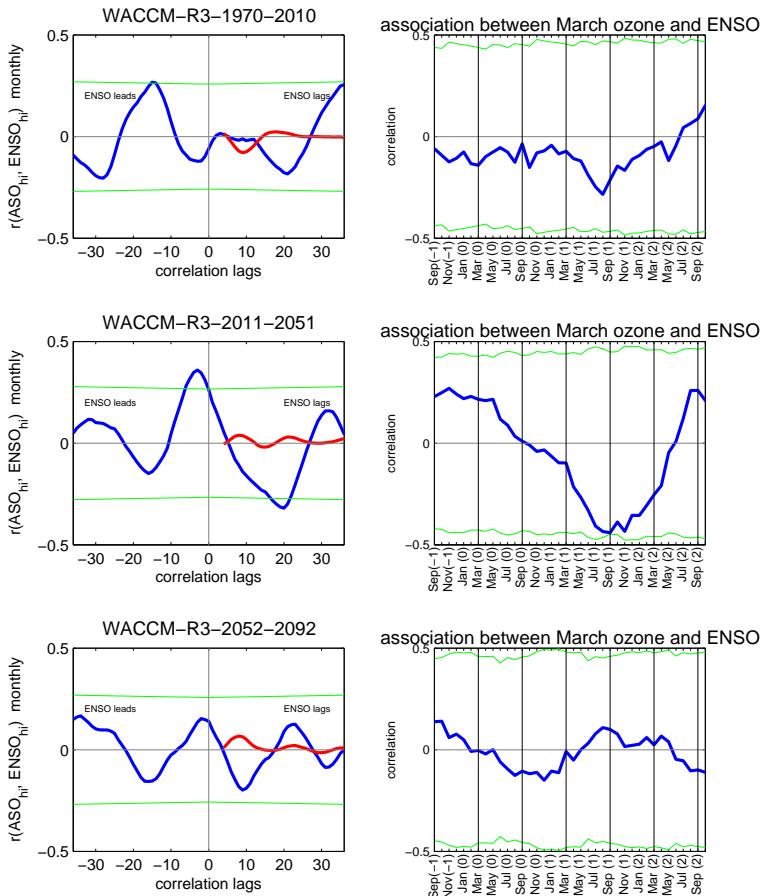
**Fig. S 33.** As in figure 6 of main body, but for Niwa run #5



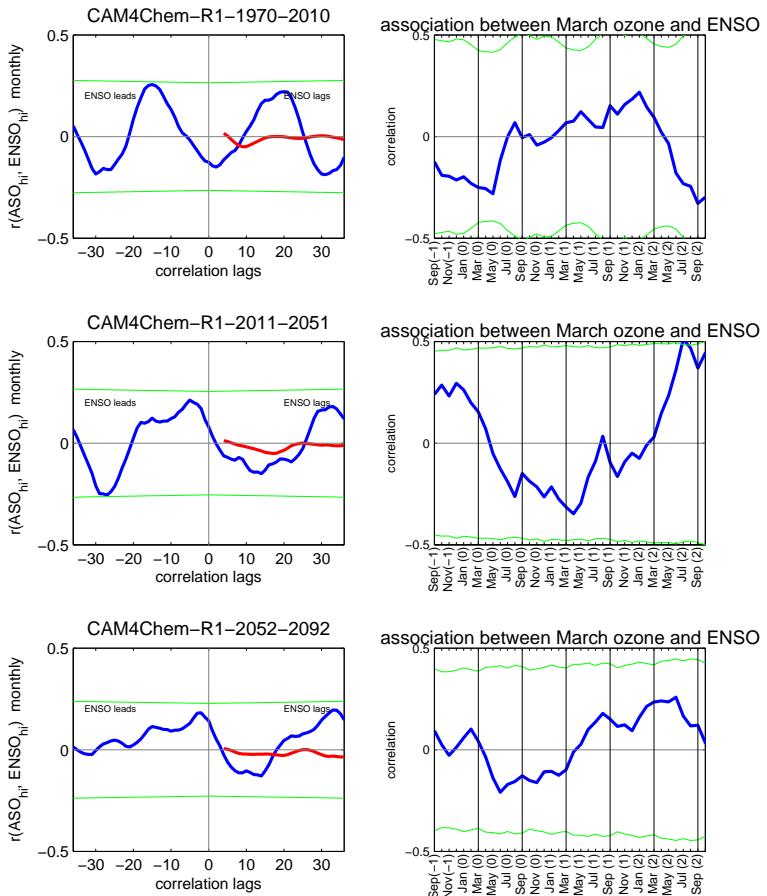
**Fig. S 34.** As in figure 6 of main body, but for NCAR-WACCM run #1



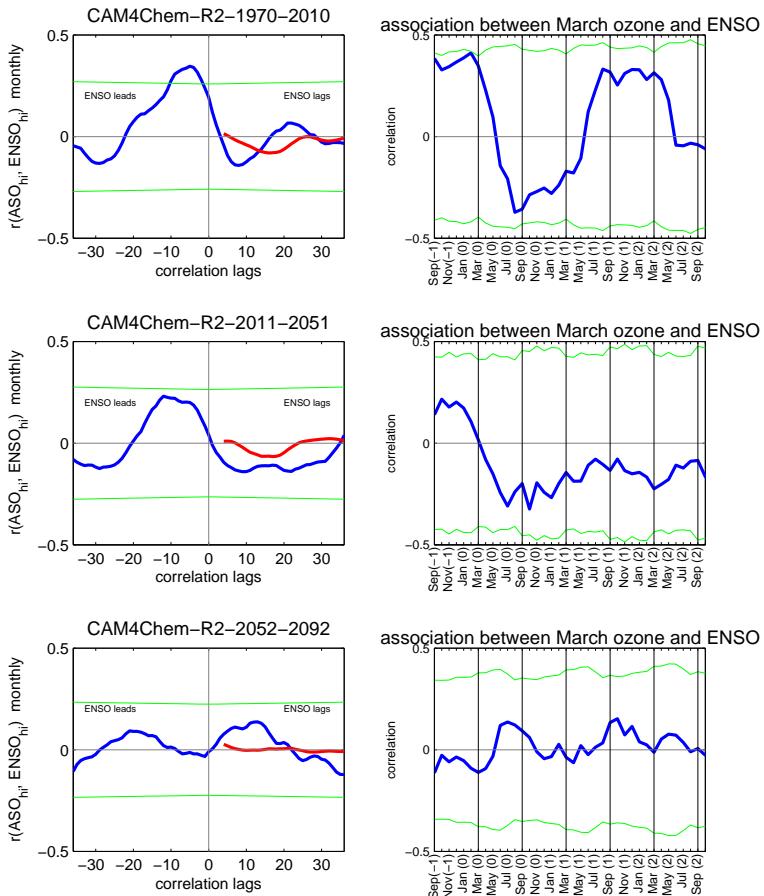
**Fig. S 35.** As in figure 6 of main body, but for NCAR-WACCM run #2



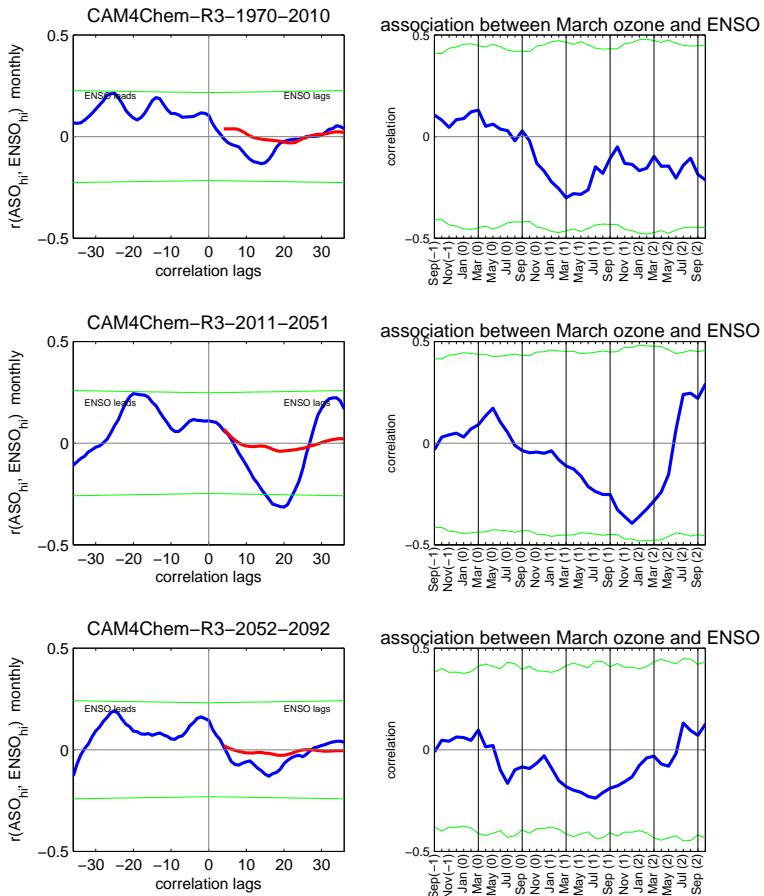
**Fig. S 36.** As in figure 6 of main body, but for NCAR-WACCM run #3



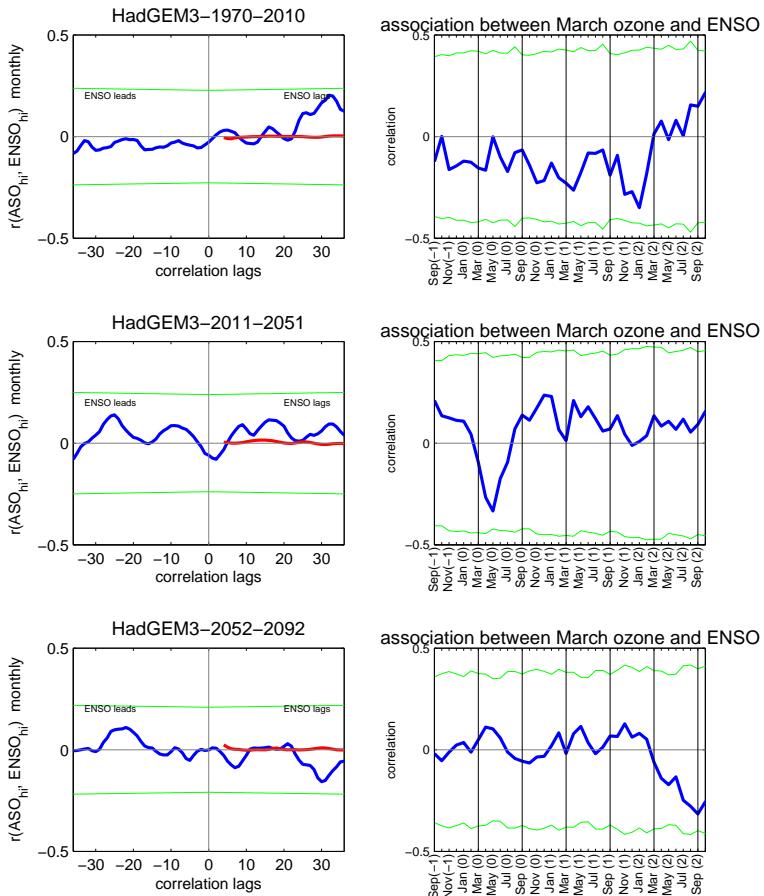
**Fig. S 37.** As in figure 6 of main body, but for NCAR-CAM4Chem run #1



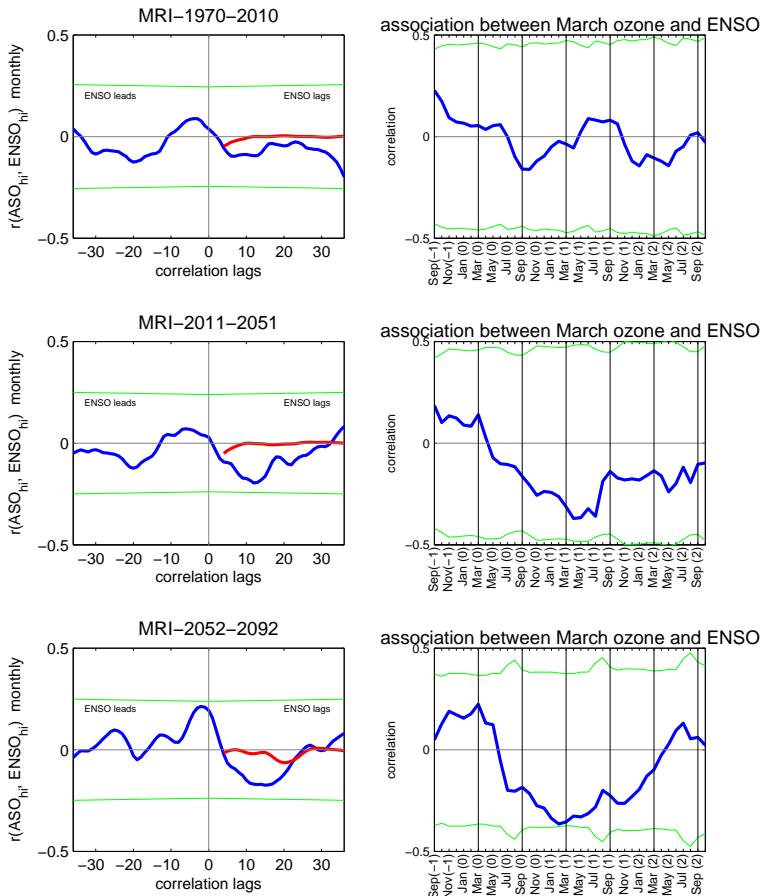
**Fig. S 38.** As in figure 6 of main body, but for NCAR-CAM4Chem run #2



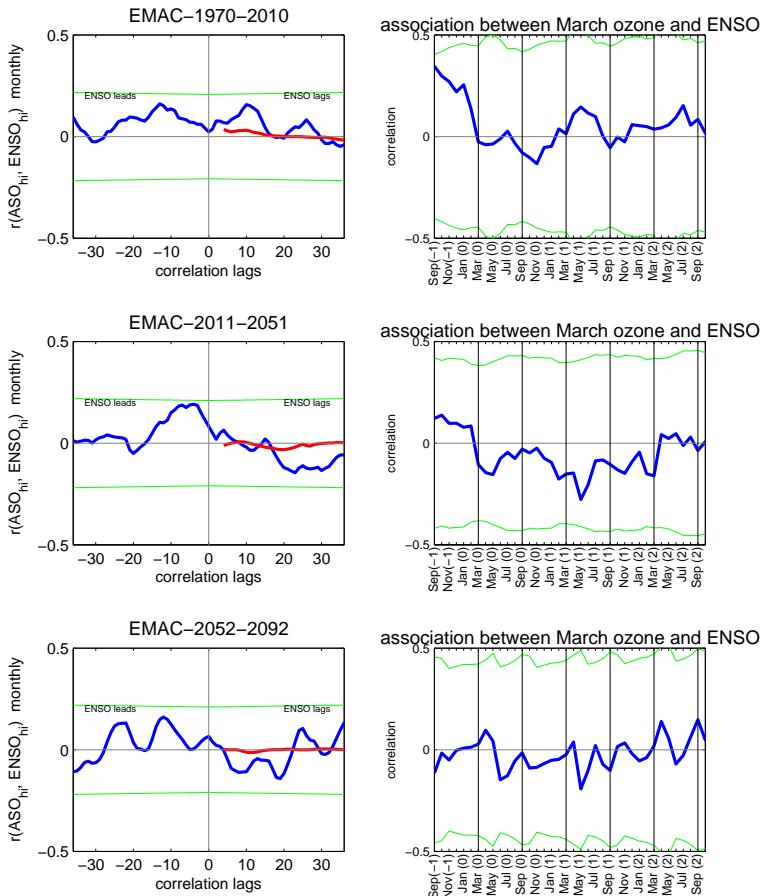
**Fig. S 39.** As in figure 6 of main body, but for NCAR-CAM4Chem run #3



**Fig. S 40.** As in figure 6 of main body, but for HadGEM



**Fig. S 41.** As in figure 6 of main body, but for MRI



**Fig. S 42.** As in figure 6 of main body, but for EMAC

*Acknowledgements.* CIG was supported by the Israel Science Foundation (grant number 1558/14) and by a European Research Council starting grant under the European Union’s Horizon 2020 research and innovation programme (grant agreement No 677756). We thank those involved in model development at GSFC-GMAO, and support by the NASA MAP program. We thank Valentina Aquila for performing some of the experiments discussed here, and Darryn W Waugh and Margaret M Hurwitz for suggestions. High-performance computing resources were provided by the NASA Center for Climate Simulation (NCCS). Correspondence and requests for data should be addressed to C.I.G. (email: chaim.garfinkel@mail.huji.ac.il). El Niño indices based on the ERSSTv4 data were downloaded from [cpc.ncep.noaa.gov/data/indices/ersst4.nino.mth.81-10.ascii](http://cpc.ncep.noaa.gov/data/indices/ersst4.nino.mth.81-10.ascii).

## **References**