

Supporting Information for ”Reducing Southern Ocean biases in the FOCI climate model”

Joakim Kjellsson^{1,2}, Sebastian Wahl¹, Sabine Bischof¹, Lasse Kummer²,

Torge Martin¹, Robin Pilch-Kedzierski^{1,3}, Mathias Zeller¹, Malin Ödalen¹,

Wonsun Park^{4,5}

¹GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany

²Christian-Albrechts-Universität zu Kiel, Germany

³Now at: Universität Hamburg, Germany

⁴Center for Climate Physics, Institute for Basic Science (IBS), Busan, Republic of Korea

⁵Department of Climate System, Pusan National University, Busan, Republic of Korea

Contents of this file

1. Figures S1 to S8

References

Trenberth, K. E., & Caron, J. M. (2001, 8). Estimates of Meridional Atmosphere and Ocean Heat Transports. *Journal of Climate*, 14(16), 3433–3443. Retrieved from <http://www.tandfonline.com/doi/full/10.1080/08037050802513387>[http://journals.ametsoc.org/doi/10.1175/1520-0442\(2001\)014%3C3433:EOMAAO%3E2.0.CO;2](http://journals.ametsoc.org/doi/10.1175/1520-0442(2001)014%3C3433:EOMAAO%3E2.0.CO;2) doi: 10.1175/1520-0442(2001)014(3433:EOMAAO)2.0.CO;2

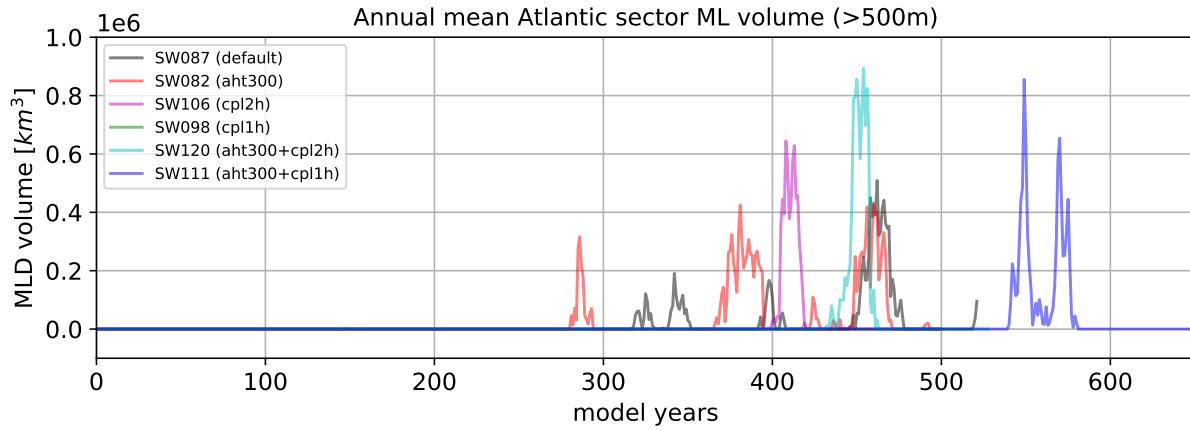


Figure S1. Mixed-layer volume in the Atlantic sector of the Southern Ocean where mixed-layer depth $> 500\text{m}$.

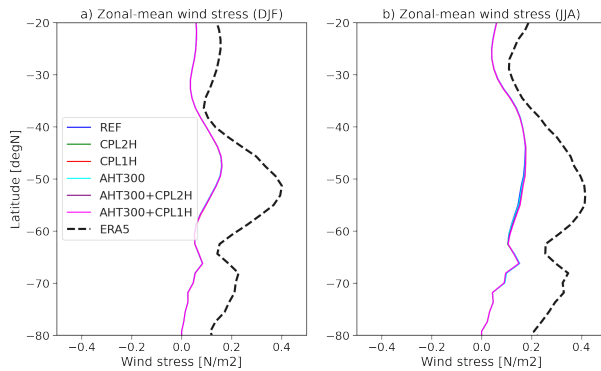


Figure S2. Winter (JJA) mean (year 200-500) zonal mean surface wind stress over the Southern Ocean in all experiments and ERA-5 averaged over 1979-2020.

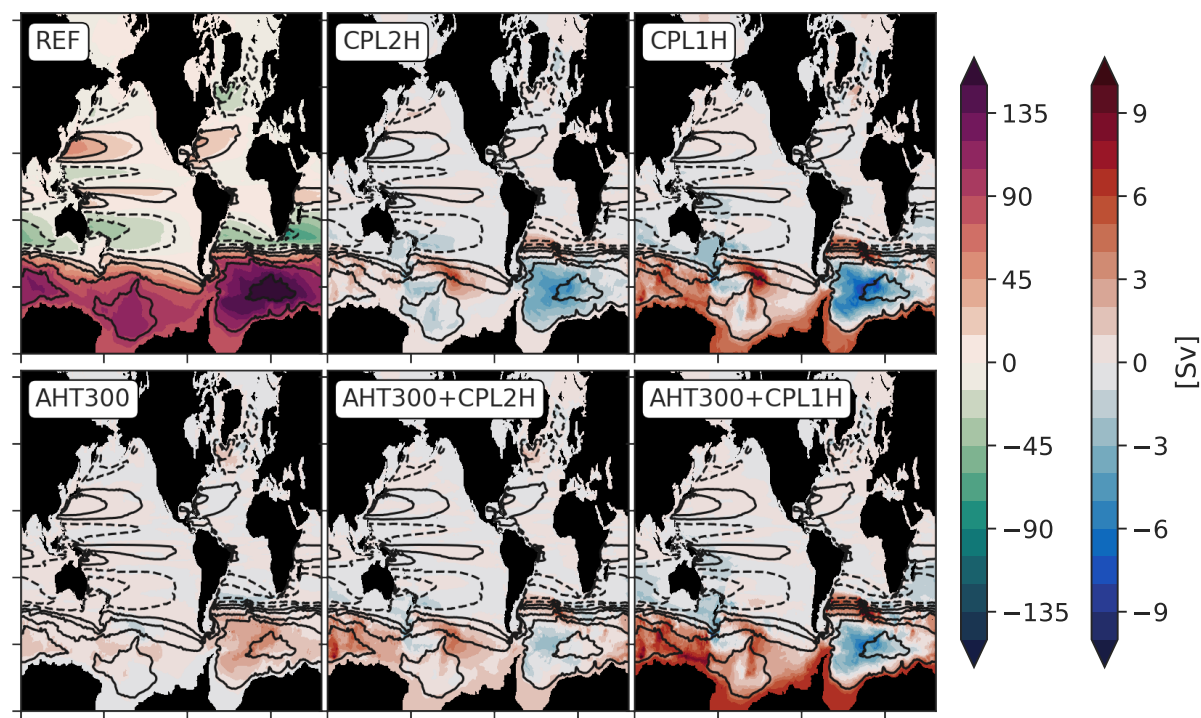


Figure S3. Barotropic stream function for REF (top, left) and difference to the REF (others).

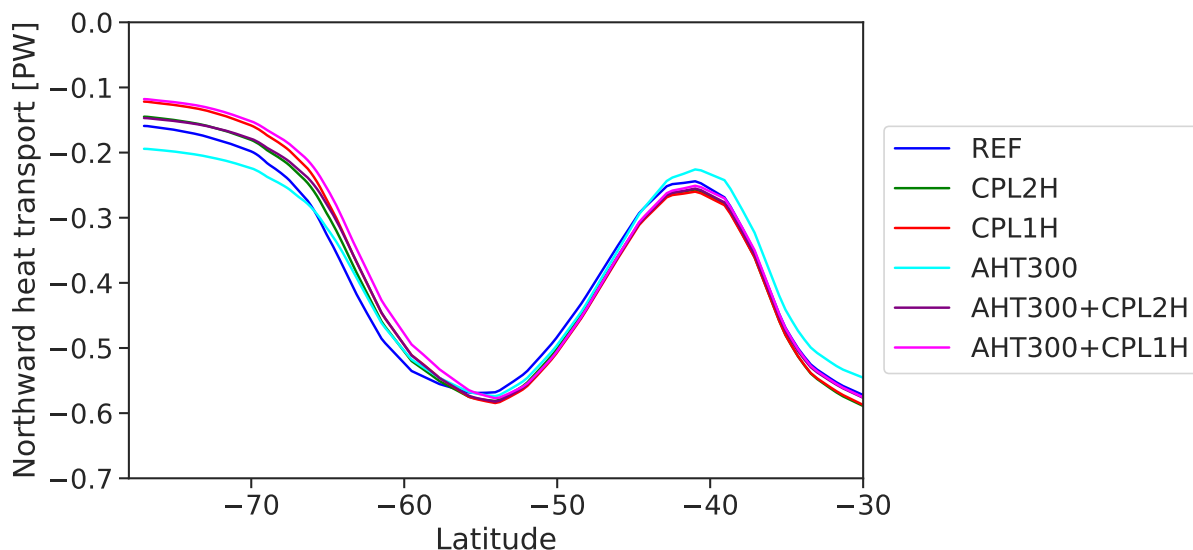


Figure S4. Northward oceanic heat transport (in PW) in the Southern Ocean for all 6 experiments.

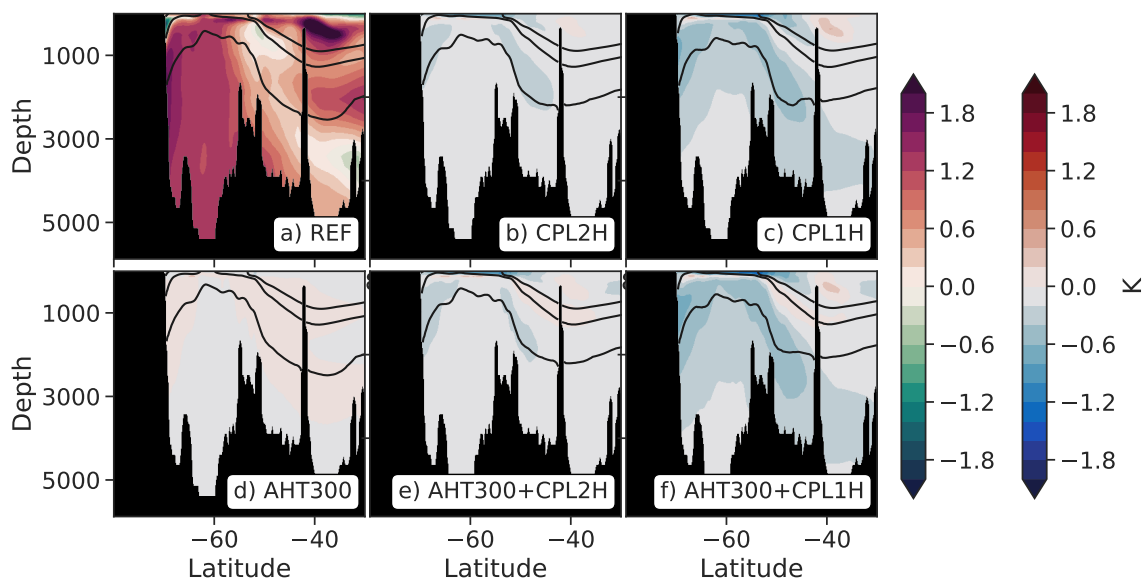


Figure S5. Bias in potential temperature in REF (a) and difference to REF for all other simulations (b-f). Taken at a cross section at 0°E, i.e. through the Weddell Sea.

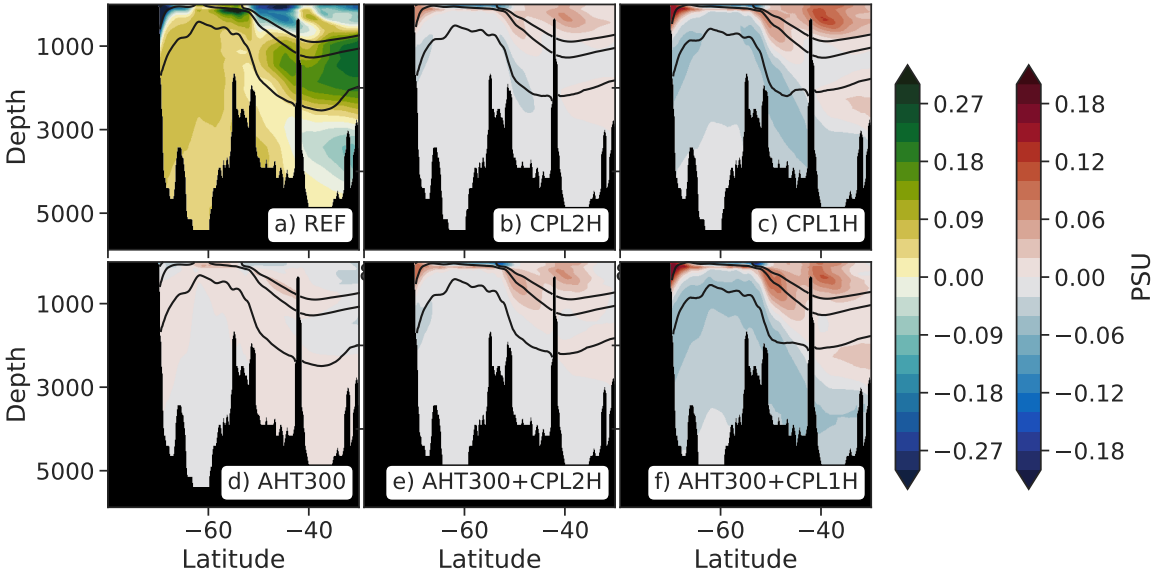


Figure S6. As Fig. S5 but for salinity.

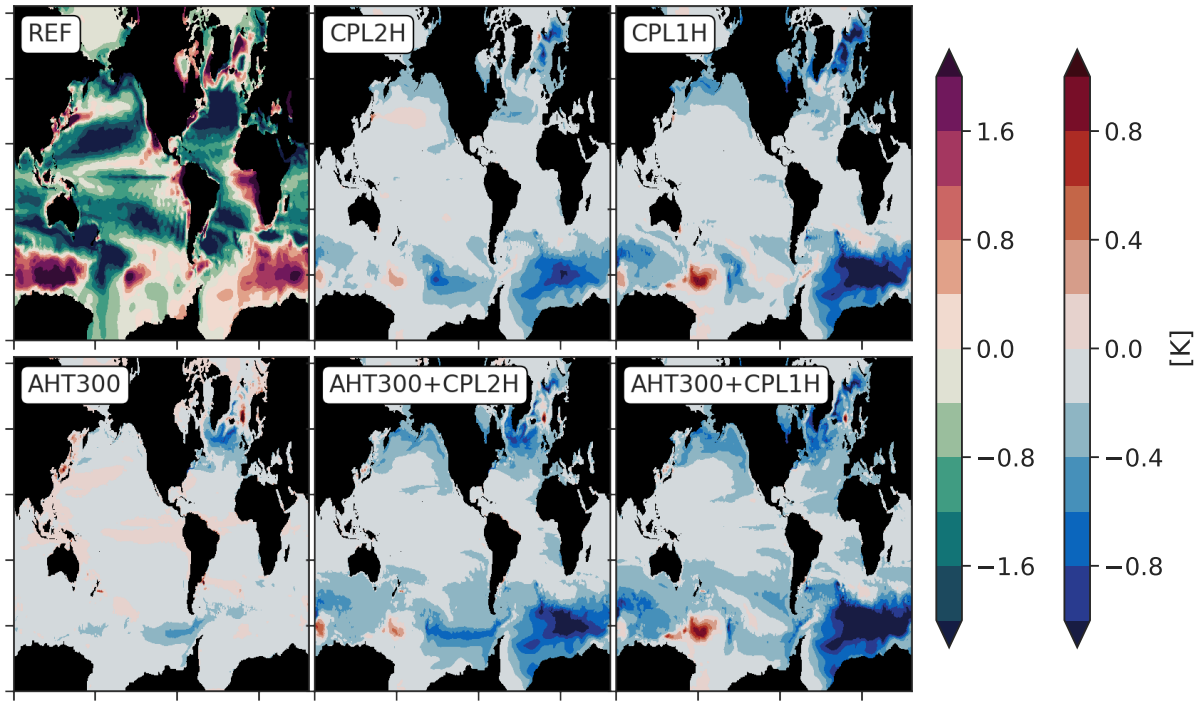


Figure S7. SST bias in all simulations.

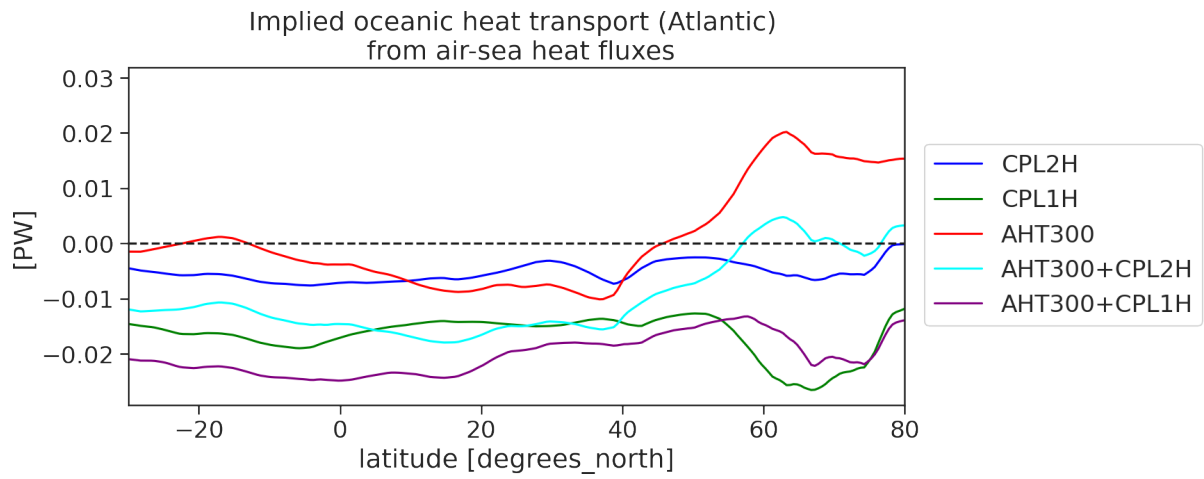


Figure S8. Implied poleward heat transport in the Atlantic Ocean computed from air-sea heat fluxes (cf. Trenberth and Caron (2001)). Lines show difference between each experiment and REF.