



Supplement of

Development and evaluation of CNRM Earth system model – CNRM-ESM1

Roland Séférian et al.

Correspondence to: Roland Séférian (rseferian.cnrm@gmail.com)

The copyright of individual parts of the supplement might differ from the CC-BY 3.0 licence.

- Supplementary Figures -

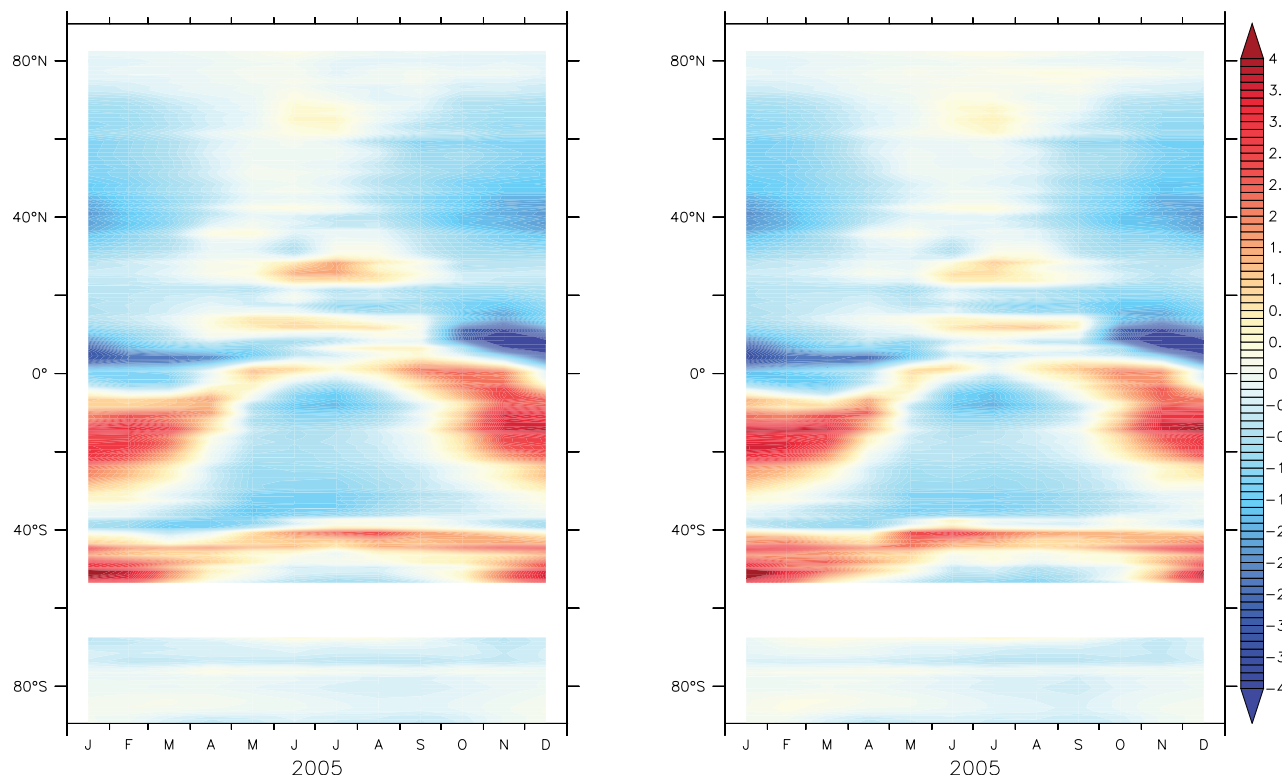


Figure S 1: Seasonal variation of continental precipitation anomaly as simulated by CNRM-CM5.2 (left panel) and CNRM-ESM1 (right panel).

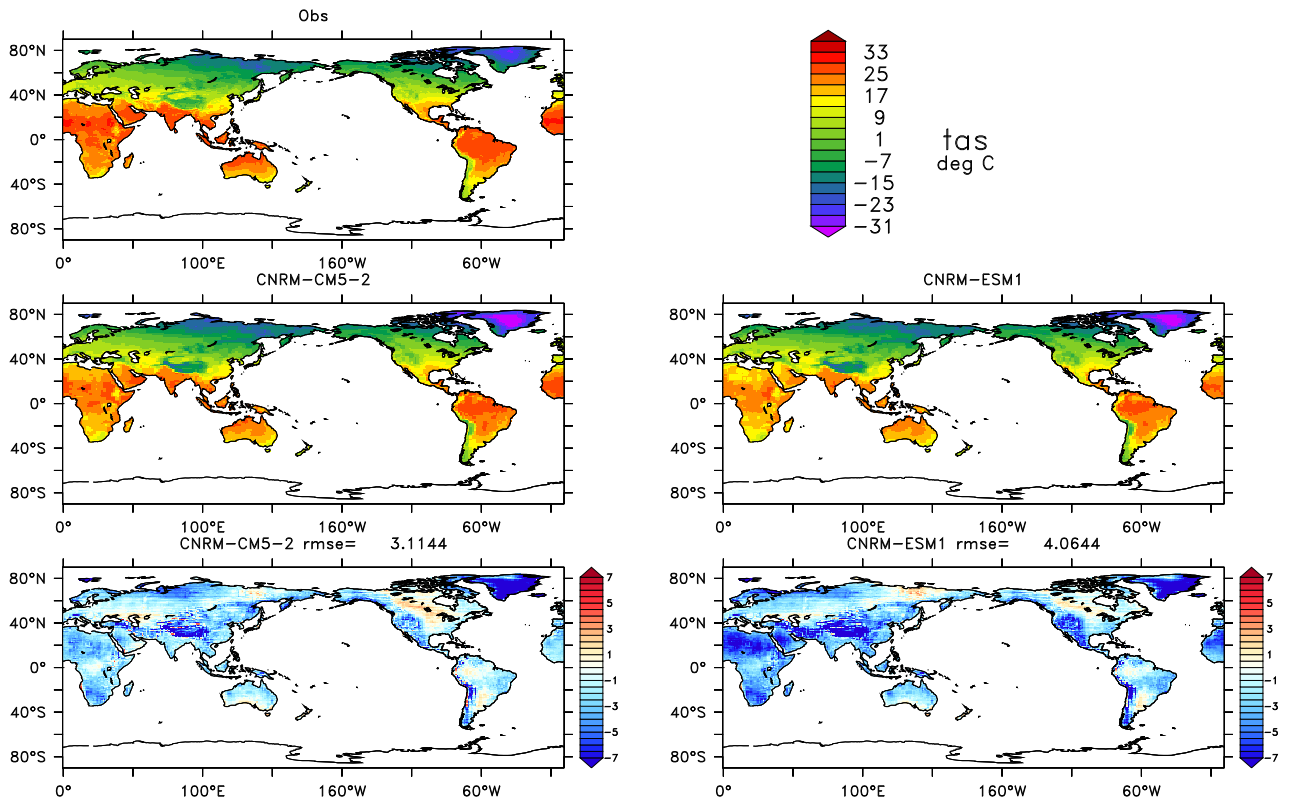


Figure S 2: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of surface air temperature (tas) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

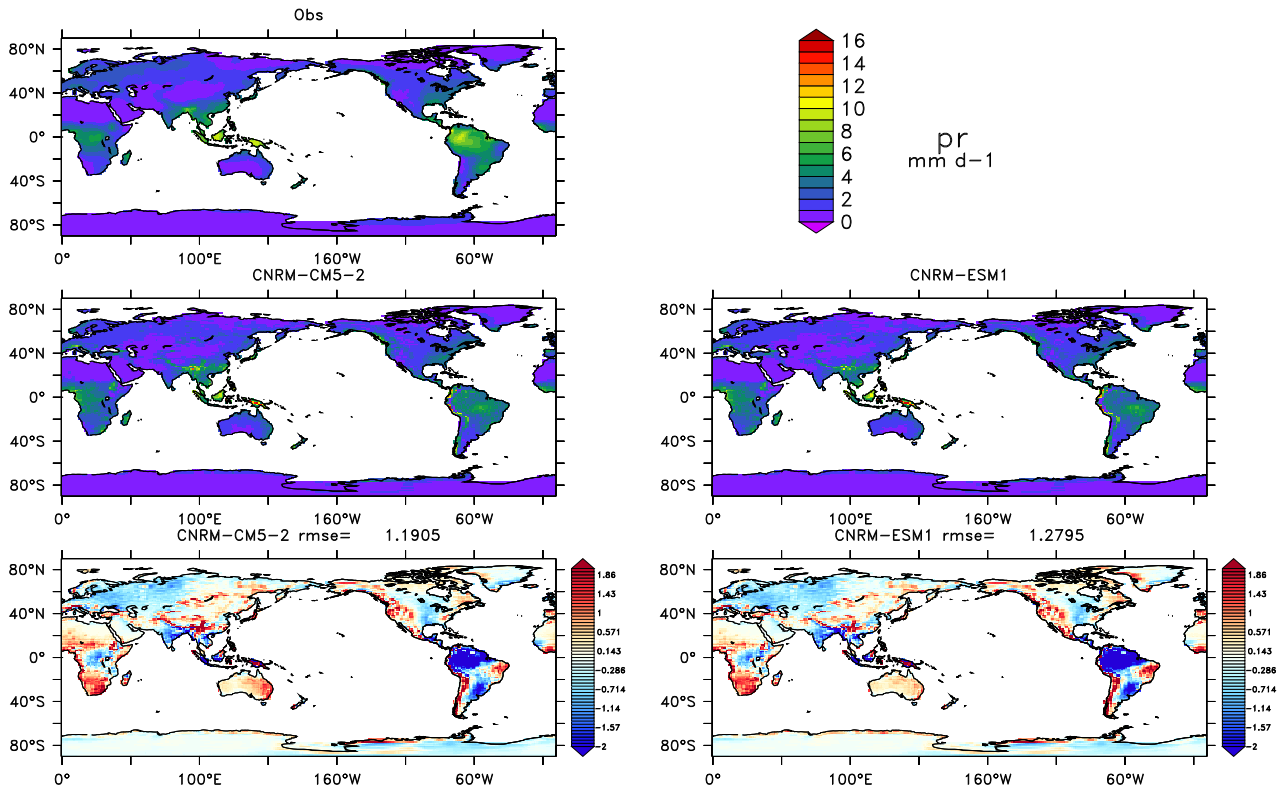


Figure S 3: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of continental precipitation (pr) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

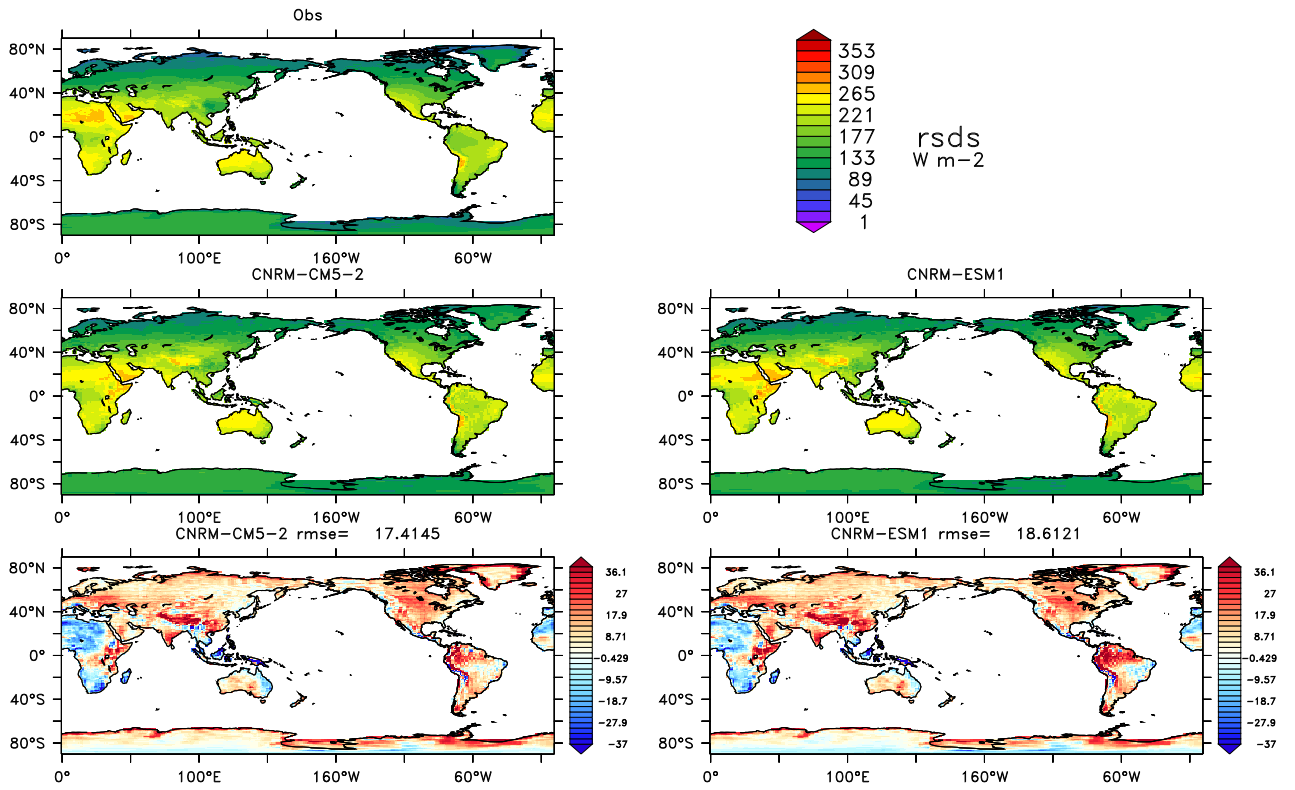


Figure S 4: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of incoming shortwave radiation (rsds) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

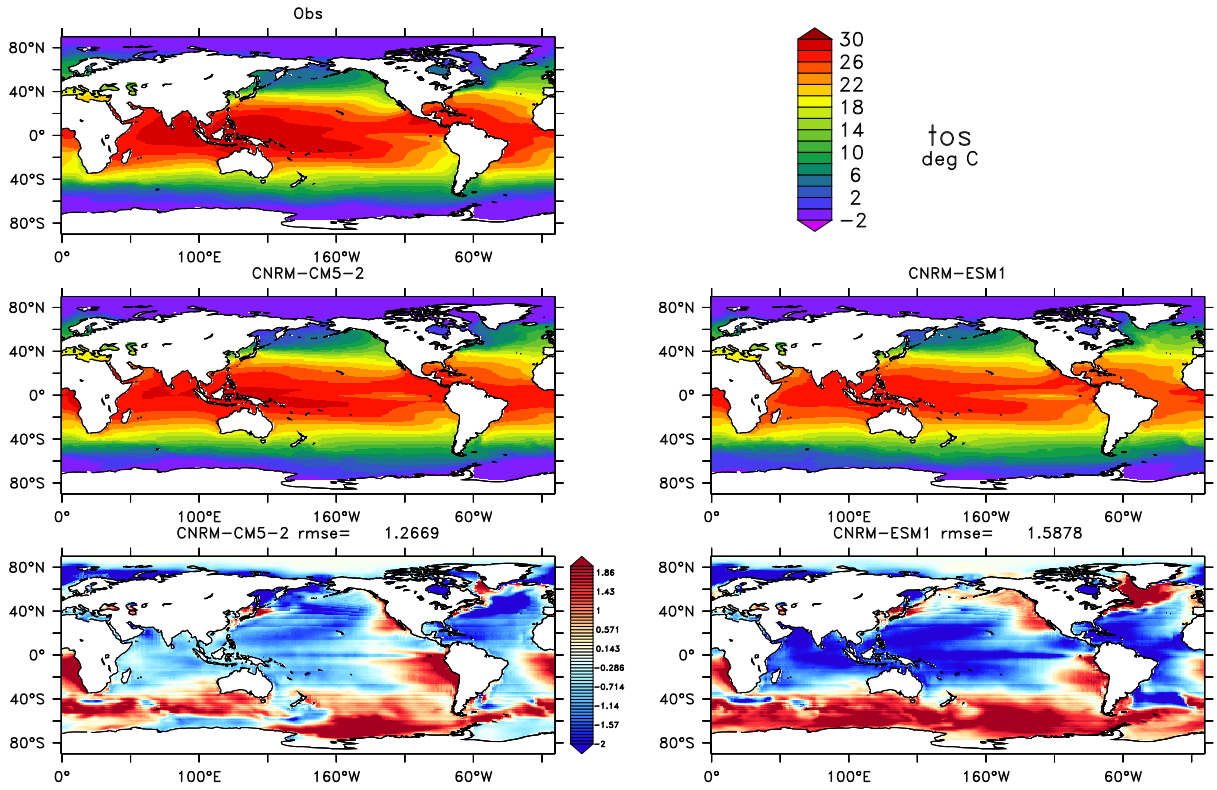


Figure S 5: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of ocean surface temperature (tos) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

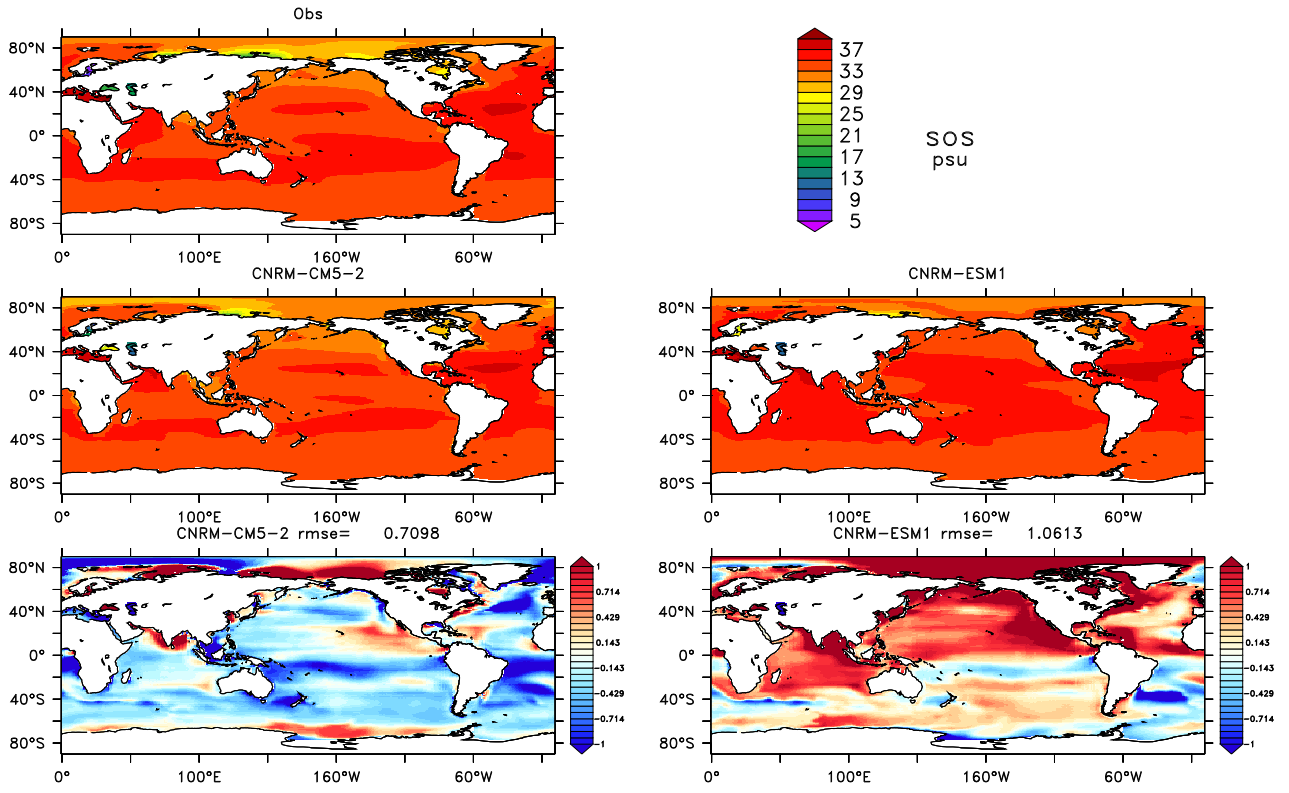


Figure S 6: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of sea surface salinity (sos) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

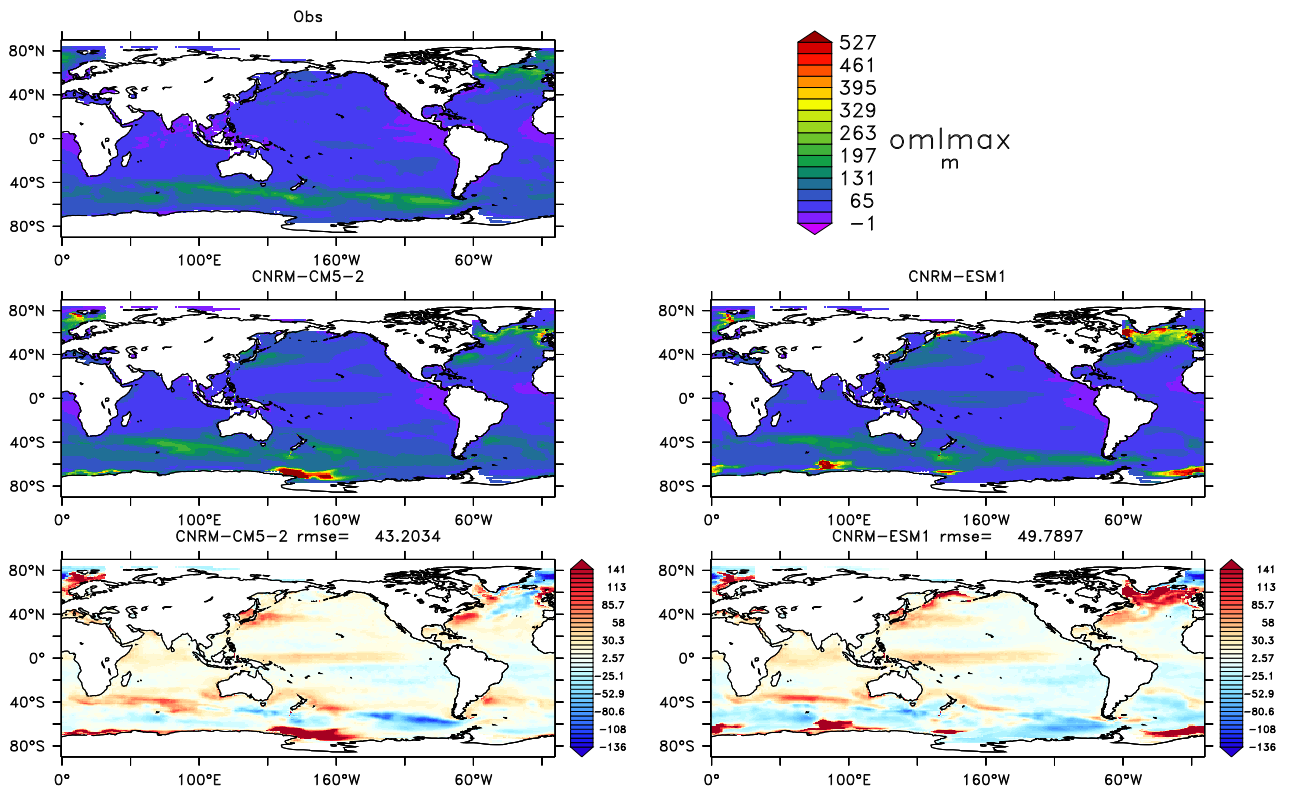


Figure S 7: Comparison of CNRM-CM5.2 and CNRM-ESM1 in their ability to reproduce the annual mean climatology of the ocean mixed-layer depth (omlmax) as observed from 1986 to 2005. Fields value are error are presented in column for a given model.

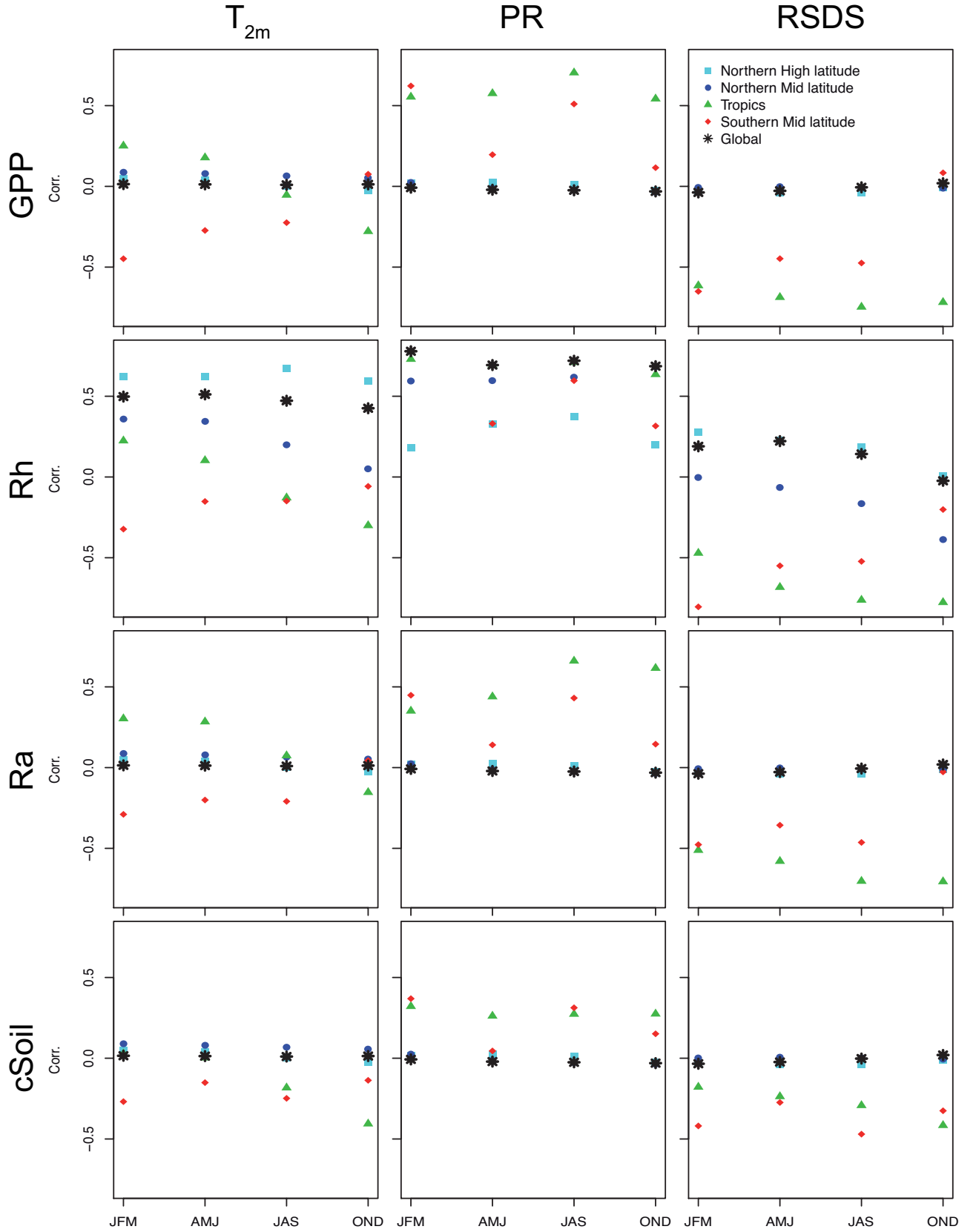


Figure S 8: Spatial correlation between land carbon cycle parameters and physical drivers. Land carbon cycle parameters are the growth primary productivity (GPP), autotrophic and heterotrophic respiration (Ra and Rh, respectively) and the stock of soil carbon (cSoil). The physical drivers are the near-surface air temperature (T_{2m}), precipitation (PR) and incoming shortwave radiation (RSDS). Correlation is computed at global scale (star symbol) and over Northern High latitude (square), Northern Mid latitude (circle), tropics (triangle) and Southern Mid latitude (diamond) between fields averaged over the four seasons (JFM, AMJ, JAS, OND) from 1986 to 2005.

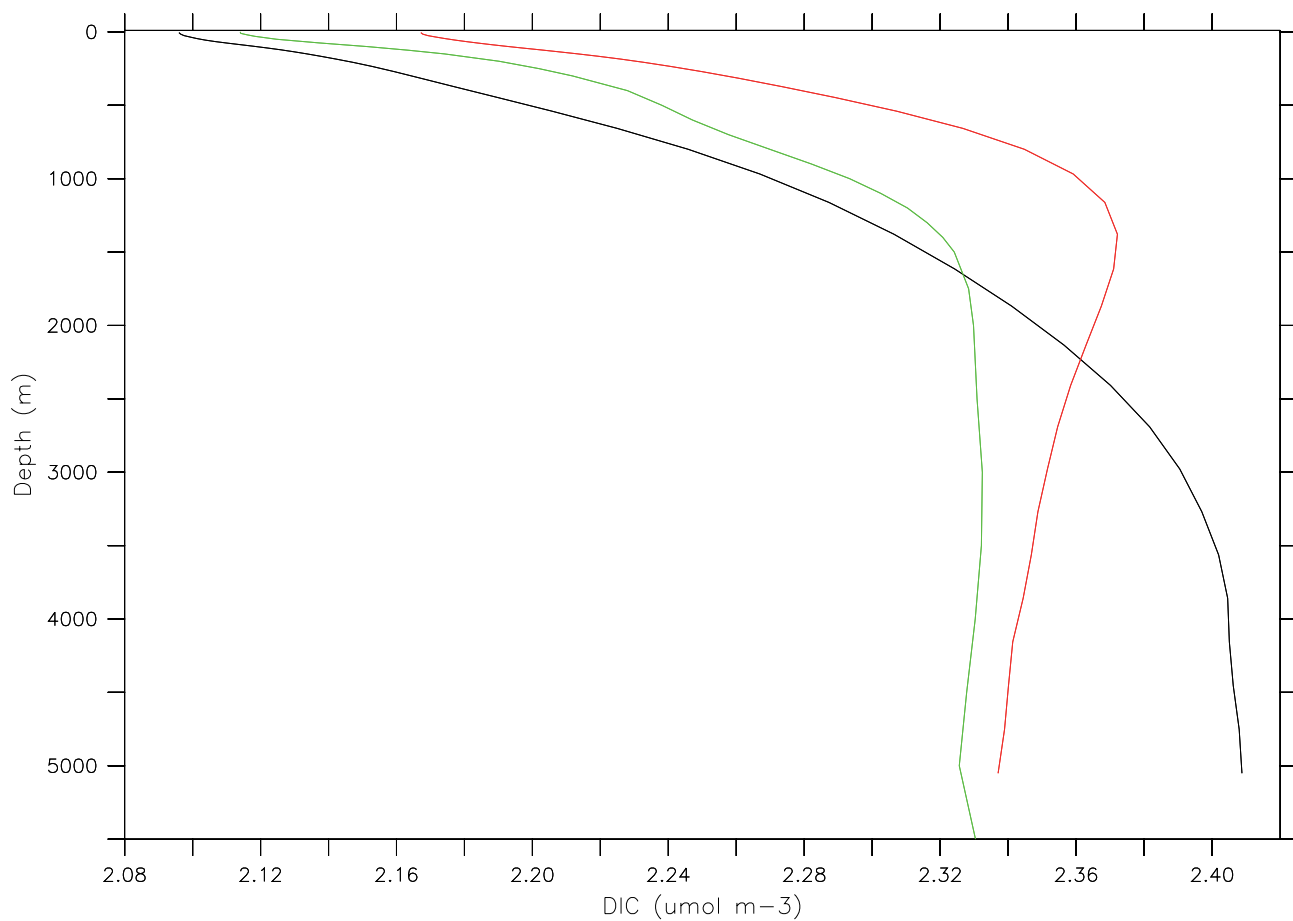


Figure S 9: Vertical profiles of dissolved inorganic carbon concentration averaged over the Southern Ocean (South of 30°) as simulated by CNRM models and provided by GLODAP observation (Key et al., 2004). Observations, CNRM-CM5.2 (Séférián et al., 2013) and CNRM-ESM1 profiles are represented by green, black and red solid lines. Observations use 1994 as single reference year, whilst model results have been averaged over 1986-2005.

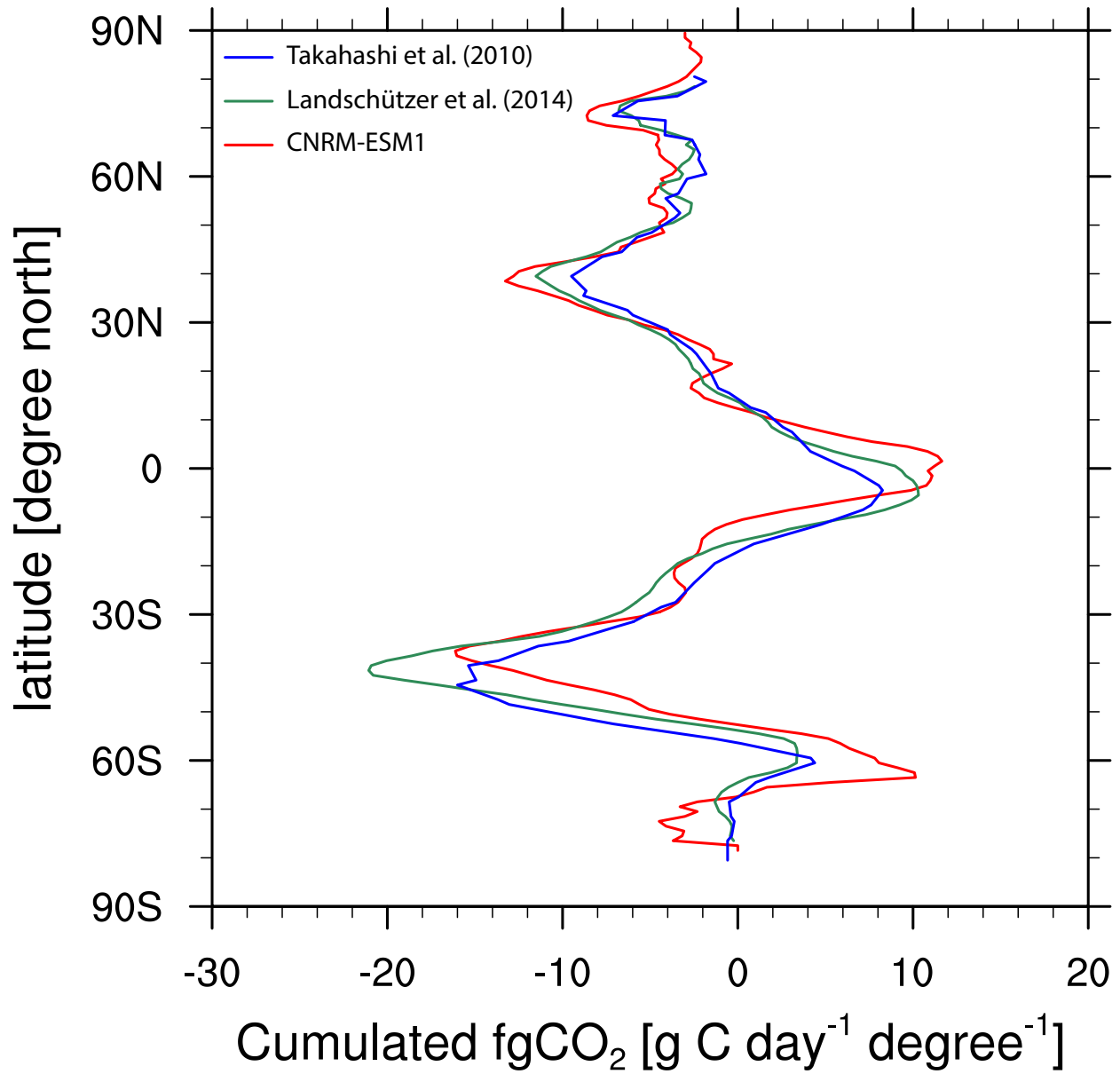


Figure S 10: Zonally-cumulated ocean carbon fluxes (fgCO_2) averaged over 1986-2005 from observation-derived estimates and as estimated by CNRM-ESM1. Observation-derived estimates from Takahashi et al. (2010) and Landschützer et al. (2014) are represented with blue and green solid lines, respectively. Result from CNRM-ESM1 is given with a solid red line.

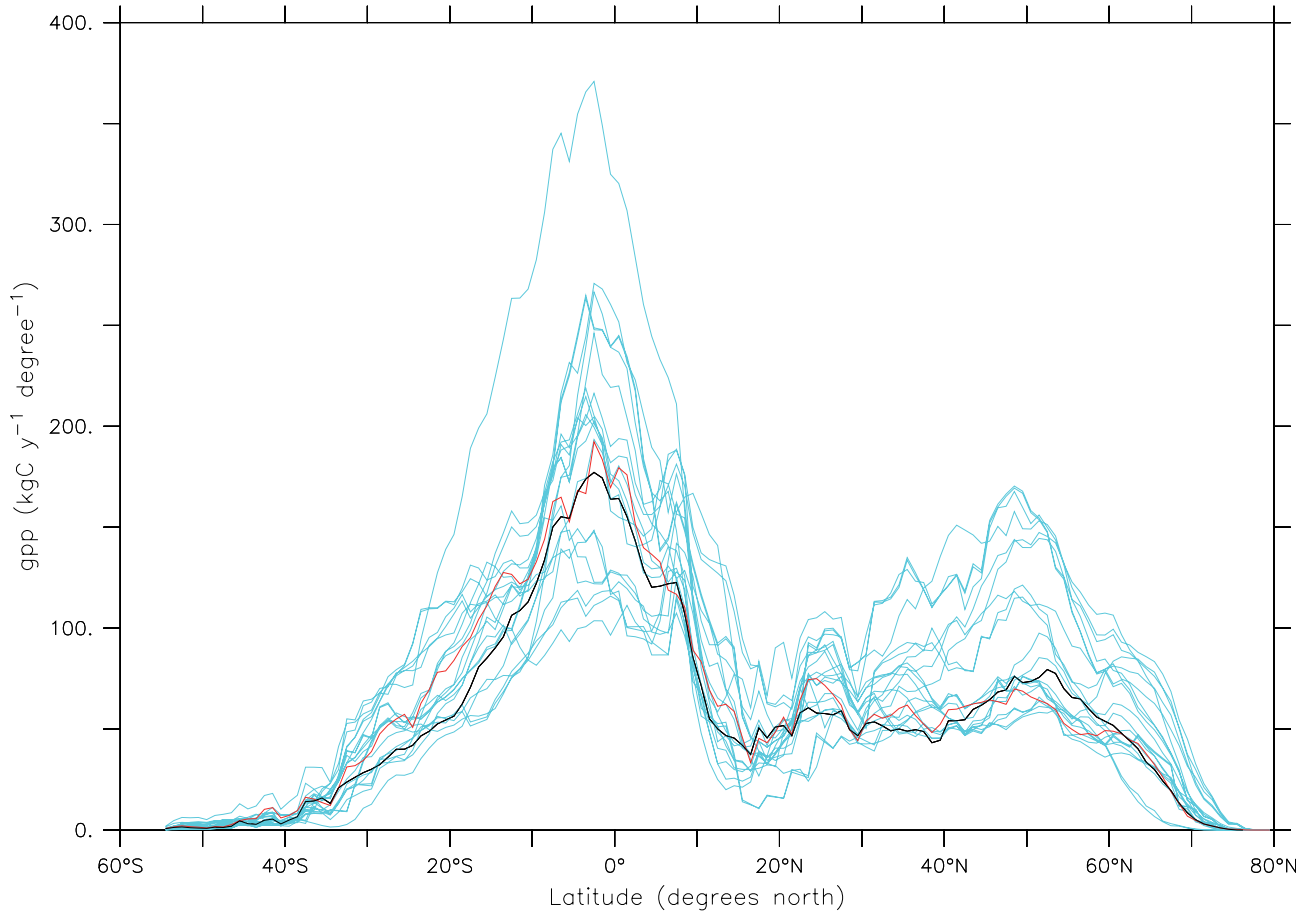


Figure S 11: Zonally-cumulated gross primary productivity (gpp) averaged over 1986-2005 from observation-derived estimates and as estimated by CMIP5 Earth system models (ESMs) plus CNRM-ESM1. Observation-derived estimates from FluxNet-MTE (Jung et al., 2011) are represented with a solid black line. Result from CNRM-ESM1 is given with a solid red line, while those of the various CMIP5 ESMs are indicated with solid blue lines. This ensemble of CMIP5 ESMs accounts for results from bcc-csm1-1, BNU-ESM, CanESM2, inmcm4, IPSL-CM5A-LR, IPSL-CM5A-MR, IPSL-CM5B-LR, MIROC-ESM-CHEM, MIROC-ESM, HadGEM2-CC, HadGEM2-ES, MPI-ESM-LR, MPI-ESM-MR, MRI-ESM1, GISS-E2-H-CC, GISS-E2-R-CC, GISS-E2-R, NorESM1-ME, GFDL-ESM2G, GFDL-ESM2M and CESM1-BGC.

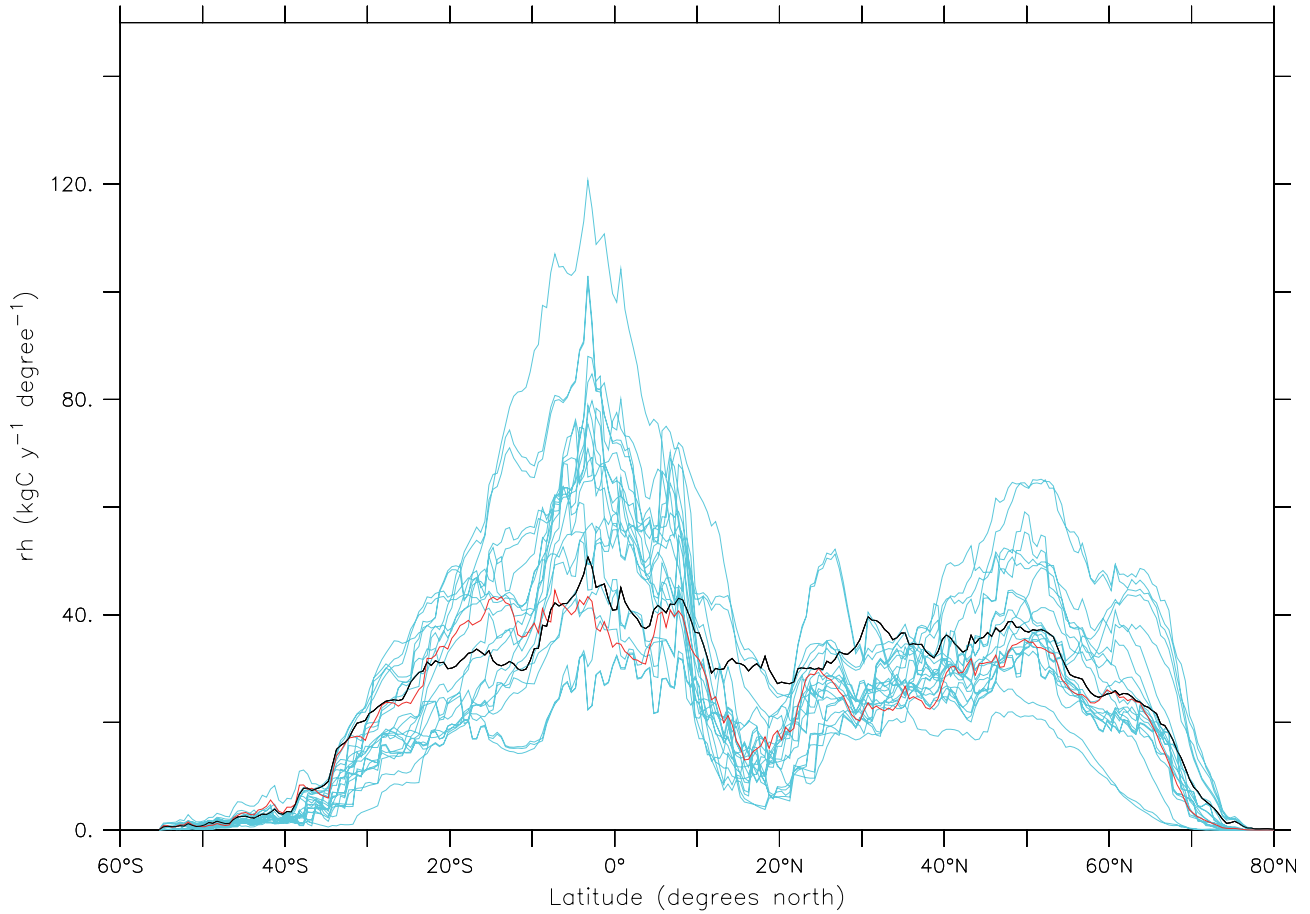


Figure S 12: Zonally-cumulated heterotrophic respiration (rh) averaged over 1986-2005 from observation-derived estimates and as estimated by CMIP5 Earth system models (ESMs) plus CNRM-ESM1. Observation-derived estimates from Hashimoto et al. (2015) are represented with a solid black line. Result from CNRM-ESM1 is given with a solid red line, while those of the various CMIP5 ESMs are indicated with solid blue lines. This ensemble of CMIP5 ESMs accounts for results from bcc-csm1-1, BNU-ESM, CanESM2, inmcm4, IPSL-CM5A-LR, IPSL-CM5A-MR, IPSL-CM5B-LR, MIROC-ESM-CHEM, MIROC-ESM, HadGEM2-CC, HadGEM2-ES, MPI-ESM-LR, MPI-ESM-MR, MRI-ESM1, GISS-E2-H-CC, GISS-E2-R-CC, GISS-E2-R, NorESM1-ME, GFDL-ESM2G, GFDL-ESM2M and CESM1-BGC.