Supplement of

Continued increase in atmospheric CO₂ seasonal amplitude in the 21st century projected by the CMIP5 Earth system models

F. Zhao and N. Zeng

Correspondence to: N. Zeng (zeng@atmos.umd.edu)
Figure S1. Seasonal cycles of global and regional total –NBP, averaged over 1961-1970 (black) and 2081-2090 (red). The last month of the year is repeated. The Northern and Southern subtropics are clearly out of phase and largely cancel each other out. GFDL-ESM2M represents the largest tropical contribution to its global –NBP seasonal cycle (maxima in September and minima in June) of all models, accounting for about a quarter of the amplitude increase.
Figure S2. Spatial patterns of $-NBP$ (gC m$^{-2}$ day$^{-1}$) changes between 2081-2090 and 1961-1970, during peak growing season (May-July mean) for the 10 models.
Figure S3. Spatial patterns of $-\text{NBP (gC m}^{-2} \text{ day}^{-1})$ changes between 2081-2090 and 1961-1970, during dormant season (October-December mean) for the 10 models.
Figure S4. CO$_2$ seasonal amplitude (1951-2100) from eight models (excluding INM and IPSL) at the model grid that covers Mauna Loa, Hawaii (19.5°N, 155.6°W) at 700hPa. The thick black line represents seasonal amplitude of observed Mauna Loa CO$_2$ records during 1959-2005. All curves are computed by the CCGCRV package. Note that 1951-2005 model data are from esmHistorical, and 2006-2100 data are from esmRCP85.
Figure S5. CO$_2$ seasonal amplitude (1951-2100) from 8 models (excluding INM and IPSL) at the model grid that covers Point Barrow, Alaska (71.3N, 156.5W) at lowest level (four models at 1000hPa, and four others at 925hPa). The thick black line represents seasonal amplitude of observed Point Barrow CO$_2$ records during 1974-2005. All curves are computed by the CCGCRV package. Note that 1951-2005 model data are from esmHistorical, and 2006-2100 data are from esmRCP85.
Figure S6. Spatial patterns of soil moisture (cm) changes between 2081-2090 and 1961-1970, during peak growing season (May-July mean) for the 10 models.
Figure S7. Spatial patterns of soil moisture (cm) changes between 2081-2090 and 1961-1970, during dormant season (October-December mean) for the 10 models.
Figure S8. Spatial patterns of near-surface soil temperature (°C) changes between 2081-2090 and 1961-1970, during peak growing season (May-July mean) for the 10 models.
Figure S9. Spatial patterns of near-surface soil temperature (°C) changes between 2081-2090 and 1961-1970, during dormant season (October-December mean) for the 10 models.
Figure S10. Changes of crop fraction between future (2081-2090) and historical (1961-1970) periods for five CMIP5 ESMs. Except for INM-CM4, the models show similar patterns of crop fraction change, which is expected given they are all driven by the same land cover change scenario.