Team MIROC: Variability in the 20th Century simulation with a coupled climate model under the different forcing conditions

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We performed the 20th century warming simulation to detect a variation originated from the difference of external forcing scenarios with a global coupled ocean-atmosphere general circulation model. MIROC 3.2 medres, which participated in World Climate Research Programme's Coupled Model Intercomparison Project phase 3 (CMIP3), is utilized for the 20th century simulation under a new forcing scenario for CMIP5. The purpose of the study is to clarify the difference of climatological response by the comparison with the 20th century simulation submitted into CMIP3 and to examine its factor. The simulation consists of ten ensembles and is forced with both natural and anthropogenic forcings: changes in solar irradiance, stratospheric volcanic aerosols, well-mixed greenhouse gases. tropospheric and stratospheric ozone, surface emissions of anthropogenic carbonaceous aerosols, precursors of sulfate aerosols and land-use. The calculation is conducted for the period from 1850 to 2000. The simulation showed a slower increase of the global mean surface air temperature (GMSAT) than that based on the old forcing scenario in the first half of 20th century. The slower pace of the global warming is contributed by cooling occurred mainly in the northern hemisphere and weaker warming around the tropics. On the other hand, a more rapid increase of GMSAT than that in the oldforcing-based simulation was detected in the second half of the century accompanied by stronger warming signals with a ubiquitous geographical distribution. The differences in the first and second half of the century might be generated from the different long-term tendencies of the solar irradiance and the emitted aerosols, respectively. In addition to this simulation, we will carry out more experiments with different combinations of forcing conditions to investigate the factor causing the above difference.