Geophysical Research Abstracts
Vol. 18, EGU2016-5688, 2016
EGU General Assembly 2016

Enhancement of non-CO_2 radiative forcing via intensified carbon cycle feedbacks

Andrew MacDougall and Reto Knutti
ETH Zurich, Institute for Atmospheric and Climate Science, Zurich, Switzerland (andrewhughmacdougall@gmail.com)

The global carbon cycle is sensitive to changes in global temperature and atmospheric CO_2 concentration, with increased temperature tending to reduce the efficiency of carbon sinks and increased atmospheric CO_2 enhancing the efficiency of carbon sinks. The emission of non-CO_2 greenhouse gasses warms the Earth but does not directly change atmospheric CO_2 concentration. Therefore these agents are expected to reduce the efficiency of carbon sinks. Here we present idealized climate model experiments that explore this indirect interaction between non-CO_2 forcing and the atmospheric CO_2 concentration. The experiments suggest that this interaction enhances the warming effect of the non-CO_2 forcing by up to 25% after 150 years of non-CO_2 forcing. The enhanced warming effect grows the longer the forcing agent is present in the atmosphere but is nearly independent of the magnitude of the non-CO_2 forcing. The lingering warming of the system over 100 years after the dissipation of the non-CO_2 forcing can be substantial if the forcing is sustained for a long period of time. Overall our results suggest that the longer emissions of non-CO_2 forcing agents persists the greater effect these agents will have on global climate.