



HadGEM2-ES Climate-carbon Cycle feedbacks in CMIP5/AR5 simulations

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The global carbon cycle is a crucial component of the Earth System which plays an important role in determining the future climate response to a given scenario of anthropogenic CO₂ emissions. Since direct observations of atmospheric CO₂ began in the 1950s the atmospheric airborne fraction of CO₂ emissions has remained remarkably constant, with the natural carbon cycle absorbing approximately half of the human-emitted CO₂. However, feedbacks between the climate and the carbon cycle have the potential to change this airborne fraction with significant consequences for planning emissions pathways to achieve climate mitigation targets.

HadGEM2-ES is the most recent climate model used at the Met Office Hadley Centre. It comprises the HadGEM2 coupled atmosphere-ocean GCM, and also several important Earth-system components including terrestrial and ocean carbon cycle, and atmospheric chemistry. It is being used to perform the CMIP5 centennial simulations for inclusion in the next (5th) IPCC Assessment Report due in 2013. Here we present initial results from HadGEM2-ES to diagnose both the magnitude of the climate-carbon cycle feedback from idealised 1%-CO₂-rise simulations, and also the implications for this feedback in historical and future scenario transient simulations. We find that the climate-carbon cycle feedback is less strong than in a previous Hadley Centre GCM, and quantify the role of various components of the carbon cycle such as the Amazon forest and the representation of soil organic carbon storage.