Coordinated climate change projections experiments for AR5

1. Near term (2005-2030)

Higher resolution AOGCM (desire roughly _ to 1 degree, but other resolutions possible)

1950-2005 coupled initialization/verification

a) Single GHG concentration scenario, at least a 10 member ensemble

simple chemistry and aerosols active, dynamic vegetation (re-growth and succession-related changes), no carbon cycle

b) Option: Three additional single member experiments with e.g. different aerosols and pollutants, low medium and high

c) Option: Possible geo-engineering experiments

2. Long term (2005-2100 and beyond)

Lower resolution AOGCM (roughly 2 degree)

Pre-industrial spin-up, 20th century forced experiment , natural and anthropogenic (at least 10 member ensemble)

Two GHG and aerosol concentration scenarios supplied by WG3: 1. reference (e.g. high forcing, perhaps A2-type), and 2. stabilization (e.g. low forcing, perhaps B1-type); at least one ensemble member each (carbon cycle and biogeography/succession active; chemistry and aerosols prescribed time-evolving) to 2100, stabilized after 2100 out to 2300

Experiment 1: ESM-type model run with time series of those specified concentrations; carbon cycle produces time series of CO_2 fluxes that are saved—this CO_2 does not enter the atmosphere to change climate system response to specified concentration time series (give these fluxes to WG3 to derive mitigation policies to achieve desired emissions); groups without carbon cycle can also run this experiment to get climate response

Experiment 2: fix atmospheric CO_2, temperature remains about the same, specify CO_2 concentrations from exp 1 that only carbon cycle sees, save CO_2 fluxes

Diagnose emissions:

CO_2 concentration change = emissions – CO_2 fluxes

(derived emissions will be noisy, and WG3 will fit to smoother emission pathways)

Comparing emissions gives size of carbon cycle feedback

To get the temperature (climate) response for magnitude of the carbon cycle feedback:

Experiment 3 (optional): Take derived emissions from experiment 2 and run in an experiment 1 type experiment but with full interactive carbon cycle; difference in temperature response between experiments 1 and 3 is the magnitude of the carbon cycle feedback

Need to coordinate WG1 (WGCM) and WG3 (need comparable group to WGCM in WG3 that represents/acts for the community to produce scenario information for WG1 models); for short term: Atmospheric Chemistry and Climate (AC&C) could produce chemistry and aerosol gridded time series (across IGBP and WCRP)

Also need a WG2 group for socio-economic information