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Biogeosciences Discussions



# *Interactive comment on* "Impacts of land cover and climate data selection on understanding terrestrial carbon dynamics and the $CO_2$ airborne fraction" *by* B. Poulter et al.

**Anonymous Referee #2**

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This manuscript highlights the sensitivity of one model (LPJ-DGVM) to input data selection, specifically climate and land-use data. There are important effects on carbon fluxes, both in their means and interannual variability. Most previous global modeling studies focus on other aspects of uncertainty, or do not consider uncertainty at all. Forcing uncertainty is often considered to be small or neglected. Therefore, this is an important and novel manuscript. The sensitivity of global NEE to temperature, a key carbon cycle feedback, is especially dependent on the choice of climate and land-use dataset. Although this result is specific to one model, it suggests that this parameter is highly sensitive to small differences in driver datasets in a way that would likely apply to other models as well. It is also intriguing that the upward trend in NEE is significant



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Interactive Discussion

Discussion Paper

and occurs in all of the simulations, confirming earlier studies and giving more weight to this result.

In general the manuscript is well-written. The organization and presentation of results is appropriate; however there are a number of areas in which I feel the level of detail is inadequate to understand or reproduce the results. I feel the manuscript should be accepted after a number of revision and additions that address the comments below.

P 1618 Line 12-13: It would be useful to state the averaging period upfront here – which model years were averaged to get the NPP and soil respiration numbers? P1620 Lines 25-26: Please state or provide a reference for the spatial interpolation method used to regrid the NCEP and ERA-interim datasets. P1621 Is LPJ-DGVM able to use the monthly CRU data directly as input, or is some kind of temporal downscaling necessary to produce daily or subdaily forcing? How does LPJ-DVGM translate from cloud fraction to solar radiation? Please provide more detail about the hindcasting of ERA-interim and NCEP-DOE datasets back to the period 1901-1930. For example with ERA-interim, is the 1989-2010 period cycled back in time with the superimposed long-term trend in CRU? I suspect that the results are sensitive to the method of hindcasting – has this been explored? Is the same hindcasting method used in the transient run for ERA-interim and NCEP-DOE to obtain forcing data for the entire 20th century? P1624 lines 15-18 I don't understand this explanation for the higher NEE sensitivities for NCEP-DOE and ERA-interim. I'm not sure you can ignore water limitations. I guess that (and other work has shown that) ENSO is the primary driver of NEE variability through its impact on tropical regions (primarily drought stress). ENSO is also strongly correlated with global temperature variability. The effects of ENSO in the model may be exacerbated when using NCEP because it has higher radiation and lower precip (thus more water stress) over tropical South America. You could look into this further through sensitivity analyses at specific locations. In any case it is a key result and should be explained in more detail. Lines 18-20 It would be useful to separate table 5 into tropical, temperate and high-latitude sensitivities to better see the contributions of each. I also don't understand the explanation for why ERA-interim has higher sensitivity at mid-latitudes. I assume each model run uses the same respiration sensitivity parameters. P1625 lines 13-15 Why do the cooler and wetter NCEP-DOE and ERA-interim forcings cause relatively higher NEE sensitivities? Because there is a separate spinup for each run, the dynamic PFT fractions should also be near the optimal climate conditions when using these products. Or does the spinup work better somehow for CRU? P1625 lines 26-28 Can the authors provide further detail about the causes of decreased NPP/NEP in the model? Is this an impact of long-term drought – do all three driver products show similar precipitation trends in these regions? If it is drought, why isn't there a corresponding decrease in RH as soil moisture decreases, or is this decrease offset by increasing temperature? Table 3- there appears to be an error in NEE entry for the second simulation (NEE = -41.91) Fig 2 – there is an error in the title (should be gC m-2 a-1, not PgC a-1)

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Interactive comment on Biogeosciences Discuss., 8, 1617, 2011.

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Interactive Comment