

## ***Interactive comment on “The impacts of climate, land use, and demography on fires during the 21st century simulated by CLM-CN” by S. Kloster et al.***

**Anonymous Referee #1**

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This paper addresses the impacts of climate, land use and demography on global wildland fires during the 21st century as simulated by a coupled-carbon-fire model. The paper is appropriate for Biogeosciences Discussions after some revision, in my opinion. My biggest concern is that there is only one emission scenario that is being used - A1B. The results show a great deal of variability from the two climate projections ( 17 and 62% increases) and these are significant as wildland fires release the equivalent of 20-30% of present day fossil fuel emissions as the authors point out. I believe it would be useful to have an A2 emissions scenario as well. I am unclear if the emissions include those from smouldering fires that can burn in deep organic layers like peatlands for long periods of time. Some argue that our estimates of emissions may be conservative due to underestimation of smouldering fires (Turetsky et al. 2011 as cited by the authors). The current model does not take into changes of vegetation; this is a significant caveat

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that deserves more attention. It is assumed that the burned area was assumed to affect the different PFT's in proportion to their abundance. This is a large assumption and in some parts of the world may not be appropriate (see papers by Cummings). The model was validated against global carbon emissions for 1997-2004 from satellite observations; this is a short period and satellite observations although may be the best available global data are still a crude approximation. The climate anomalies were defined from a base period of 1948-1972 but the baseline for carbon emissions was 1985-2009 – why not the same time period for both? I would like to see more discussion on the relationship between human population and fire occurrence. What about the role of arson? Also, fire management may be at the point of diminishing returns in some regions such that even modest increases in fire occurrence will lead to significantly more escapes (Flannigan et al. 2009).

Minor points Title – should specify wildland fires Abstract and throughout the paper the term fire behavior is used and this may not be the most appropriate term. For example, at the end of the first paragraph in the Abstract...changes in fire behavior will turn impact climate – fire activity may be more appropriate. The shift of up to 4 months in the maximum burning period is surprising. Population estimates may be optimistic as we will hit 7 billion this month (October). There has been some recent future fire occurrence modeling for Canada – see Wotton et al. (2010). Flannigan, M.D., Stocks, B.J., Turetsky, M.R. and Wotton, B.M. (2009). Impact of climate change on fire activity and fire management in the circumboreal forest. *Global Change Biology*, 15: 549-560. DOI: 10.1111/j.1365-2486.2008.01660.x. Wotton, B.M., Nock, C.A. and Flannigan, M.D. (2010). Forest fire occurrence and climate change in Canada. *International Journal of Wildland Fire*, 19, 253-271.

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