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**Geoscientific
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Discussions**

Interactive comment on "Development of high resolution land surface parameters for the Community Land Model" *by* Y. Ke et al.

Anonymous Referee #1

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This is a poorly developed paper with major factual errors in scientific claims as well as methods presented and the analysis and conclusions drawn. Unfortunately this review therefore becomes a list of the factual errors and systematic problems that underlie the paper.

1. The first issue comes in the second sentence of the abstract and is repeated in the introduction and numerous places through out the paper, with the claim that the CLM 4 parameters are not available at a resolution finer than 0.5 degrees. This is stated despite the fact that Lawrence and Chase (2007) state in their abstract and introduction that:

"The new model parameters are calculated at 0.05 degrees resolution so they can be aggregated and used over a wider range of model grid resolutions globally"

And that these global 0.05 degree CLM datasets are publicly available to the CESM community at: https://svn-ccsm-inputdata.cgd.ucar.edu/trunk/inputdata/lnd/clm2/ rawdata/pftlanduse.3minx3min.simyr2000.c110913/mksrf_landuse_rc2000_c110913.nc . Prior to these datasets being publicly available with CLM4 they were available on request to any member of the CESM community from the release of CLM 3.5.

2. The next major issue comes in the misrepresentation of the CLM Plant Functional Types as land cover classes which is completely counter to the CLM ecosystem representation as described in Bonan et al (2002) which states:

"Vegetation units such as associations or biomes are arbitrary products of classification rather than natural units clearly defined in the field [Gleason, 1926, 1939; Whittaker, 1956]. They are not emergent units, but are merely composed of plant species that coexist at a given point in space and time. As a result, plant functional types, which reduce the complexity of species diversity in ecological function to a few key plant types, are being advocated to predict the composition and functioning of ecosystems in a changing environment [Woodward and Cramer, 1996; Smith et al., 1997]. Indeed, models of vegetation dynamics and biogeography routinely use PFTs [Running and Coughlan, 1988; Running and Gower, 1991; Prentice et al., 1992; Running and Hunt, 1993; Neilson, 1995; VEMAP members, 1995; Foley et al., 1996; Haxeltine and Prentice, 1996; Schimel et al., 1997; Kucharik et al.,2000]."

By using the "Plant Functional Type" mapping of Friedl et al. this ecosystem representation is lost, as the MODIS Land Cover product only specifies a single Plant Functional Type per grid cell.

3. The misrepresentation of Plant Functional Types continues into bare soil fraction. In the new datasets bare soil fraction is used interchangeably with the Bare Land land cover class of land cover mapping products. This is at best a reflection of the authors misunderstanding of the way PFTs are represented in CLM, and at worst a deliberate attempt to make the new dataset look like an improvement over the existing CLM 4

datasets. The scope to which this new method fundamentally misrepresents the land surface is evident in Figure 1 a) and b). In this plot we see that Australia, Namibia, the South West US, Central Asia and many other regions lose vast amounts of bare soil fraction in the new CLM dataset. By making these areas 100% shrub or grassland PFT is a complete distortion of the global distribution of vegetation.

4. This comes to the heart of the issues of this paper and the methods supporting it. The paper makes the claim that the new parameters are a substantial improvement on the existing CLM4 parameters which are available at the same spatial resolution with no evidence to support this claim. The deliberate reclassification of the CLM4 PFTs into arbitrary land cover classes makes the CONUS evaluation misleading at best. The statement that the new single PFT land cover classes of Friedl are a better representation than those derived from Vegetation Continuous Fields is never demonstrated. The statement that the Vegetation Continuous Fields has not been extensively evaluated is false and the Montesano et al (2009) reference given to support this statement actually demonstrates the flawed mapping assumptions used in this study:

"The forest gaps and patches that form the spatial patterns of the taiga-tundra ecotone represent internal heterogeneity that is difficult to capture on a continental-global scale map. The continuous tree cover mapping provided by the VCF product allows groups of pixels that represent patches and gaps to have attributes representing internal variability that capture the gradual nature of the boundary. The spatial variability, or texture, of the VCF product along with ancillary data may produce maps that replicate forest cover variability in a way that discrete land cover classification cannot, and may facilitate closer monitoring of subtle changes in the ecotone."

The statement that the Vegetation Continuous Fields has not been extensively validated is false as Landsat TM imagery was used as both training and validation products. In fact the use of the MODIS VCF and Landsat products have been shown to be extremely reliable representation of vegetation globally as in:

Hansen, M.C., Stehman, S.V., Potapov, P.V., Loveland, T.R., Townshend, J.R.G., DeFries, R.S., Pittman, K.W., Stolle, F., Steininger, M.K., Carroll, M., Dimiceli, C. (2008) Humid tropical forest clearing from 2000 to 2005 quantified using multi-temporal and multi-resolution remotely sensed data. PNAS, 105(27), 9439-9444

Where:

"Moderate spatial resolution (250 m, 500 m, and 1 km) data from the MODerate Resolution Imaging Spectroradiometer (MODIS) are imaged nearly daily at the global scale, providing the best possibility for cloud-free observations from a polarorbiting platform. However, MODIS data alone are inadequate for accurate change area estimation because most forest clearing occurs at sub-MODIS pixel scales. High-spatial-resolution Landsat data (28.5 m), in contrast, do allow for more accurate measurement of forest area cleared. However, because of infrequent repeat coverage, frequent cloud cover, and data costs, the use of Landsat data for biome-scale mapping is often precluded. Integrating both MODIS and Landsat data synergistically enables timely biome-scale forest change estimation."

Interactive comment on Geosci. Model Dev. Discuss., 5, 1435, 2012.