**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "A spatial resolution threshold of land cover in estimating regional terrestrial carbon sequestration" *by* S. Zhao et al.

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Responses to Referee #1

[Comment 1]: The surveyed spatial resolution thresholds are based on nearest neighbor interpolation. I would assume nearly all land cover datasets as used for biogeochemical modeling so far using a rather majority based resampling algorithm. Despite one of the major aims of this study to preserve the disturbance information probabilistically at the regional scale, another main interest evolves on the effect of aggregation to a major land cover type. The analysis would benefit if different resampling methods would be considered. Page 7993 line 10 -14 Although the mean in carbon sequestration is equal between 250, 500 and 1000m resolution the interannual variability (standard deviation) at 1000m is twice as much as that of the higher resolution. When

interpreting this it is not clear what the term critical at 1km means. For me, looking at year 2001 transitional barren was lower at 1000m than for 250 and 500m, creating a different response in carbon sequestration. If I think of a wider spread of such areas, the interpretation of exaggerated IAV would start already at 1000m resolution. In this context an assessment of the relevance of certain degrees of land use/cover change would lead to more general assumptions. Possibly such analysis could start in an area defined by the coarse resolution pixel size, which did not experience land use/cover change towards heavily affected areas.

[Response]: We have added text and Figure 5 to address the issue. The change was quantified (see method in section 2.6), graphed (figure 5), and explained in the results (section 3.2)

[Comment 2]: Figure 5 What does white color represent - No carbon sequestration? If so an explanation in proceeding like this is needed. Why did you exclude these areas? Why does it represent developed areas of Muscogee exactly, but not Chattahoochee (includes large parts of forest)? Additionally there is an evident unrealistic shift at 4km resolution for the region of Chattahoochee. Further, doesn't the polygon character of the research area introduce biases when thinking of the resampling, instead of defined equal rectangular regions?

[Response]: We added the following in the caption of Figure 5 (Figure 6 in the revision): White color represents urban/residential areas (mainly the Columbus city in the central north), and the cantonments in the installation (i.e., two big contiguous areas at the central south and the right). These areas were masked because of lack of input data or proper understanding of the underlying processes.

[Comment 3]: Discussion section Talking about the implication of spatial resolution thresholds at continental to global scales, I think it is necessary to mention latest implementations of land use changes in terms of fractionation in global biogeochemical models (Zaehle 2005, Bondeau etal 2007)

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[Response]: Good point. At the end of the second to last paragraph, we added the following: "Nevertheless, there were efforts to bring land cover change information into global biogeochemical models using temporal fractional changes of land cover within each grid cell or pixel (Sitch et al., 2003; Zaehle, 2005; Jung et al., 2007; Bondeau et al. 2007; Strassmann et al., 2008). However, these approaches are not sufficient because they only simulated impacts of the net land use changes rather than detailed gross land use transitions at the grid cell level. The consequence of this treatment is not known."

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