

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 #2

[Comment 1]: My general concern: authors present their findings (critical threshold on the spatial resolution for the land cover data) based on a very local modelling study using a single resampling method. At the moment the study does not suggest universal applicability of its findings.

[Response]: We believe the study area is big enough to address all the questions related to the paper. Even if we go to national or global scales, we still have to face the issues highlighted in this paper. Our study is not intend to prove the universal applicability of the findings (who can do that anyway?) but rather the consequences

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of not considering scale dependency of land use change issues in model simulations over large areas.

[Comment 2]: The title and the abstract of the paper are misleading. Reasons for this: The title says, "threshold of land cover in estimating regional terrestrial carbon sequestration". However, the term "regional" is generally used in ecosystem terrestrial modelling for coarser scales and larger areas of a country or a subcontinent. Accordingly, the Abstract also does not reflect the local character of the study and can be mis-interpreted.

[Response]: We don't agree that the use of "regional" in this paper is misleading. The terms "regional" and "local" are relative. While it is true a country or a subcontinent becomes a region in global model simulations, several counties or a state can be a region too at the national scale. For example, the map units of ecological regions or ecoregions can be rather small at the global scale but still called regions.

[Comment 3]: Is the domain of this study representative for a larger region, let's say at least for the state of Georgia or Alabama?

[Response]: We believe the study area is representative for the state of Georgia and Alabama. Our land cover change analysis based on Landsat images (sampling approach — see Liu et al., 2004a) indicated that the land use change characteristics reported in this paper were representative for the southeastern United States.

[Comment 4]: Until the end of the discussion section (end of the paper) the limitations of the findings and importantly of the setup for this study are not mentioned. In Discussion authors admit that their findings cannot be generalized for studies at regional and continental scales. But the representativity of the study's setup should be described at the earlier stage of the paper i.e.in Methods section.

[Response]: We never said that our findings cannot be generalized for studies at regional and continental scales. In fact, we stated clearly in the paper that "the critical

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threshold value of 1 km might be universal because most of the land disturbances and management activities occur at or below this spatial scale. However, more studies should be performed to confirm or unconfirm the generality of this finding in other areas or other land cover resampling approaches”.

[Comment 5]: In the abstract, line 4: Authors write “..the influence of the spatial resolution of land cover change information on the estimated terrestrial carbon sequestration is not known”. Jung et al (2007) investigated exactly the dependencies of the carbon sequestration estimates on the spatial resolution of the land cover (fractional vs. aggregated). Authors even refer to this study later themselves.

[Response]: The sentence “... the influence of the spatial resolution of land cover change information on the estimated terrestrial carbon sequestration is not known” in the abstract does not conflict with Jung et al. (2007) who only investigated the impact of three different spatial resolutions of land cover (0.25o fractional, 0.25 o dominant, and 0.5 o dominant). Strictly speaking, Jung et al. did not simulate the impact of land use change if we refer land use change as land transitions.

[Comment 6]: Page 7985, line 17: add reference to the previous study

[Response]: Added (Zhao et al., 2009)

[Comment 7]: Page 7987, line 9: what properties?

[Response]: Added “including initial forest age and biomass, crop composition and rotation, soil texture (i.e., fractions of sand, silt, and clay), and soil organic matter content”

[Comment 8]: Page 7987, line 15: what parameters?

[Response]: Same as our response to line 9 (same page, see above). For consistency, we changed “parameters” to “properties”.

[Comment 9]: Page 7993, line 5: from the numbers given here for the minimum inter-annual carbon sequestration the threshold on the land cover resolution would be rather

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500 m, not 1 km.

[Response]: Agreed. Section 3.2 has been revised

[Comment 10]: Page 7993, line 9, line 21: same as in the line 5. from the numbers given here the threshold on the land cover resolution would be 500 m, not 1 km.

[Response]: Agreed. Section 3.2 has been revised

[Comment 11]: The choice of the critical threshold on the spatial resolution of the land cover Page 7994, line 20: Jung et al.(2007) found that the the effect of the spatial land cover resolution on the carbon sequestration estimate was small RELATIVELY to the choice of the terrestrial ecosystem model or its drivers.

[Response]: See our previous response. Again, Jung et al. (2007) did not really simulate the impacts of spatial resolutions of land cover change.

[Comment 12]: Figure 4. Are the plotted data (lines) a product of interpolation? Mention the interpolation algorithm here.

[Response]: The plot showed annual changes of carbon sequestration. See method section 2.6 for details.

[Comment 13]: The quality of this scientific contribution can be greatly improved by one of combination of the following: 1) test the threshold for other(s) resampling methods 2) test the validity of the 1 km threshold for a larger domain of a regional scale study if none of the suggested is possible to do, the results of the study still could be suitable for publication in a form of a technical note.

[Response]: We don't believe that (1) adding other resampling techniques and (2) expanding the study area will change the basic conclusions of this paper.

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