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Biogeosciences Discussions

Interactive comment on "The Unified North American Soil Map and its implication on the soil organic carbon stock in North America" *by* S. Liu et al.

S. Liu et al.

carol.shishi@gmail.com

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Reviewer Comment: 1. "Data selection problem (3.2 Stage II): As already pointed out in this article, HWSD itself is merged global dataset. Thus the authors have to go back the quality of original dataset harmonized in HWSD. Without the consideration of original dataset of HWSD in target region, simplified selection rule adopt in this study, STATSGO2 > SLC 3.2 >SLC 2.2 > HWSD 1.1 is not easily acceptable for most of readers. . ."

Author Response: As the reviewer mentioned, HWSD is the combination of four databases, including the European Soil Database (ESDB), the 1:1 million soil map of

China, various regional SOTER database and the Soil Map of the World. However, as quoted in the documentation of HWSD, ". . .the parts of the database that still make use of the Soil Map of the World such as North America, Australia, West Africa (excluding Senegal and Gambia) and South Asia are considered less reliable,. . .". For modeling hydrology and vegetation dynamics of North America we assembled the most up-to-date sources of soil information. Since there is not a single uniform database for North America, we chose the best database for each sub-region. We elaborate on that here and provide additional information in the manuscript.

We agree with the reviewer that we did not explain our selection rule very well. Our selection rule is based on whether the data is reliable and up-to-date. The HWSD for North America has not been updated since the FAO Soil Map of the World was developed in 1970s. Therefore, we give the lowest priority to HWSD. STATSGO was first published in 1994, and in 2006 the STATSGO spatial and tabular data (which contains soil attribute values) were revised and updated, and has been renamed to STATSGO2. SLC3.2 was published in 2011, and it provides soil data for the significant agricultural regions of Canada. SLC3.2 is based on SLC3.0 which was released in 2005. SLC3.2 added some additional agricultural areas with new soil attribute data. For the cells that have both STATSGO2 and SLC3.2, it is hard to choose which data is better for the cell. To improve that, we will calculate the fraction of the cell within Canada and U.S.. If most of the area of a cell is within the U.S., we will assign the STATSGO2 data to the cell, otherwise, SLC3.2 will be assigned to the cell. SLC2.0, released in 1996, not only covers the agricultural region but also some other areas in Canada. However, SLC2.0 is less reliable than SLC3.2 based on the personal contact with the officers in charge of these data. Thus, we give priority to SLC3.1 if the cell has both SLC3.2 and SLC2.0 data.

Reviewer Comment 2. "Downscaling methodology's problem (3.1. Stage I): Original STATSGO2, SLC 3.2, SLC 2.2 is consists of vector dataset, thus in principle, raster conversion in the spatial resolution of 30 arc-second as same gridded size of HWSD.

Finer scale raster data generations enable to make additional information for "sub-grid heterogeneous", when downscaling 0.25-degree gridded scale. . ."

Author Response: We are aware of the limitation caused by selecting the dominant soil component in a cell to represent the soil characteristics of the entire cell. As much as we would like to calculate the variance of soil properties within a cell, our limited resources would not allow us to complete such a time-consuming task since most cells contain several soil components with varying layers and depths. To improve our data and provide more flexibility for the users, we decide to select the three dominant soil components instead of one, and we will provide the fractions for each component as well as the associated soil property values. This improvement may allow the users to incorporate heterogeneous soils in their modeling, and quantify the uncertainty of the modeling cased by the varying soil components.

Reviewer Comment 3. "Is UNASM truly stood for ecological modeler's requests? In introduction of this article, "none of comprehensive soil dataset available" was emphasized. If so, at least it should be noted what kind of elements or variables are required in the field of ecological numerical modeling studies, based on the previous investigation reviews. However such detailed descriptions were not available in this article. In addition, the reviewer is not belong to the field of ecology, but water-related parameters such as porosity and/or available water storage capacity (AWC) is truly needed, at least, for hydrological modeling (for the estimation of volumetric water content within the soil). . ."

Author Response: We followed the example for modeling purposes set by the CONUS Soil dataset (http://www.soilinfo.psu.edu/index.cgi?soil_data&conus&data_cov&mapunit) which uses an older version of STATSGO and covers the continental United States. While there is a project underway to extend this to North America, this has not been completed and only a preliminary version for Mexico has been described (http://www.esri.com/mapmuseum/mapbook_gallery/volume19/agriculture1.html). We

provide variables and soil depth layers that are consistent with those available for the HWSD. As a result, the UNASM does not include several water-related parameters. Ecological and hydrological models often calculate these using standard pedo-transfer functions using soil texture, organic carbon matter, and bulk density provided by UNASM. We will explain this and add a short review about how the models handle the soil hydrological properties.

The reviewer also suggests updating the background dataset of HWSD from version 1.1 to the latest version1.21. Compared with version 1.0, HWSD version 1.21 has two major updates: (1) SOTWIS information has been added for Tunis, and (2) bulk density from the WISE/SOTER/ESDB is included as an additional field. In addition, HWSD version 1.21 corrects some minor errors in the old version of HWSD and eliminates the redundant mapping units. Although we use version HWSD1.1, we have applied a suggested fix to the bulk density issues, in consultation with the HWSD developers, by using the bulk density from WISE pedon data. The other updates in HWSD version 1.21 do not have great impacts on soil properties in North America for the regions where STATSGO and Canada SLCs data are not applicable. Therefore, given our limited resources, we will not regenerate data using HWSD version 1.21 for UNASM at this time.

Interactive comment on Biogeosciences Discuss., 9, 15175, 2012.