Biogeosciences Discuss., 9, C4031–C4037, 2012
www.biogeosciences-discuss.net/9/C4031/2012/
© Author(s) 2012. This work is distributed under
the Creative Commons Attribute 3.0 License.

Biogeosciences Discussions

Interactive comment on "Mapping Congo Basin forest types from 300 m and 1 km multi-sensor time series for carbon stocks and forest areas estimation" *by* A. Verhegghen et al.

A. Verhegghen et al.

astrid.verhegghen@uclouvain.be

Received and published: 17 September 2012

We are very grateful to the Referees for their reviews and short comments of our manuscript. We tried to answer in this document the different remarks and recommendations made by the Referees.

Reviewer #1 H.Baltzer

1) About "the k-means algorithm"

The k-means algorithm had been chosen as it is a common clustering method, with its ISODATA modification, in the remote sensing field. The choice of an unsupervised

algorithm was also relevant in order to deal with the wide spatial extent of the study area covered. In order to ensure that the clusters produced by the k-means classification are as interpretable as possible, several precautions have been taken. The k-means algorithm has been executed on each of the 4 zones separately. And, more than 200 initial cluster seed have been used for each zone, which is ten times the number of land cover classes we want to discriminate. This permits to have clusters that are generally easily interpretable as a single land cover class.

2) About the spatial stratification

The stratification was made very cautiously and the boundary between the central and the south and north zone correspond as far as it was possible, to the boundary of the dense moist forest. The dense moist forest is easily distinguished form the other land cover classes. It represents a sharp limit in itself. Moreover, a buffer of three pixels has been used. And when the zones were assembled, it have been checked if the same label was attributed to the same pixel belonging to two different zones. It was often the case and when not, a visual choice was made by the interpreter. So the limits between the zones are smooth and we agree to add figure showing this if found useful.

3) About the validation

We understand the remark about the quantity of validation points. However, we would like to insist on the difficulty to get validation data in this region. The effort made here was important and we had the chance to have experts from central Africa region validating the map. 51 points validated for the GLOBCVOER initiative were added, reaching a total of 151 points. It is true that some smaller classes are not validated. We can explain this more clearly in the text. However, as the user's accuracy values are weighted by the proportions of area of the various land cover classes, this ensure that classes representing large surfaces, and that are validated, have a higher weight in the overall accuracy.

We agree to add the kappa coefficient to the validation interpretation.

BGD

9, C4031–C4037, 2012

CC BY

We changed “contingency” into “confusion”.

4) About the uncertainty of the carbon map

No errors estimations were available for the Carbon estimation we used. And the data of Saatchi et al. (2011) are not available, to our knowledge. A way to add error bars to the Carbon stocks estimations of Table 7 could be to report the error of the land cover map validation (Table 4). We could propagate the error of each land cover class to Table 7.

5) The abstract provides a good summary, but it should mention the carbon stock results.

The carbon stock are now mentioned in the abstract

6) About the role of the phenology curves

The phenology curves are there mainly for a description purpose. The land cover map allows representing the spatial extension of a specific land cover class. It is also interesting to show the behavior of such vegetation through time. This shows that some land cover classes can be very similar in their EVI response at certain time of the year. Phenology curves have been used as well, at the pixel and cluster level, when labeling.

Reviewer #2 Anonymous

About the link of the work with REDD

We thank this reviewer for its advice as well as K. Tansey, questioning us on the same subject. We realize that we may not have clearly explained what our aim with the paragraph 3.2.4 and 4.4 were. Here is a proposition of modifications in order to keep the two paragraphs in the text.

We did not intend to evaluate the degradation or deforestation scenarios of the REDD MRV. But, knowing that each country, in the context of the REDD has to choose a tree cover threshold between 10 and 30% for its own forest definition, we thought that

BGD

9, C4031–C4037, 2012

our map, with its regional scale was an opportunity to see the impact of this threshold choice on the area covered by forest. We can modify the text to say that we just did a first investigation. And that according to our own interpretation, a 30% tree cover threshold seemed to be a realistic threshold for the Congo Basin countries forest definition. This first investigation has been realized according to the LCCS definition of the land cover classes. Lines 17-19 of page 7500 "The impact of two forest definitions was then assesses in the framework of the reducing emissions from deforestation and degradation (REDD) initiative" is modified into "The regional scale of the map allow suggesting that a 30% tree cover is a realistic threshold for the forest definition in the Congo Basin countries".

We changed the title of the paragraph 3.2.4 and called it "evaluation of the impact of the tree cover threshold in the forest definition on the surface covered by forests."

If reviewer 2 has another idea of how to integrate this better in the manuscript, or could detail his comment, this will be appreciated.

Short comment # 1: K.Tansey

The answers are numbered in ordrer to correspond to the number of the remarks in the short comment

1.

To avoid a too long introduction part, we synthesize the different land cover product covering Central Africa in table 1. If this is found unclear, some additional explanations could be added in part 2.1. The new map is regional, covering 8 countries i.e. Cameroon, Congo, Gabon, Burundi, Central African Republic (CAR), Equatorial Guinea, Democratic Republic of Congo (DRC) and Rwanda (p7504).

For the product you mentioned:

The regional map of Hansen et al. (2008) is regional and at a similar (250 m versus 300 m) spatial resolution. But it describes the region with only one forest class and 5

BGD

9, C4031–C4037, 2012

non forest classes. Our map of the region provides 20 land cover classes to describe the region more accurately.

The GLC 2000 for Africa is well adapted to the vegetation found in the region but is at a lower spatial resolution -1 km- and is only based on one year of SPOT VEGETATION data. By using Meris for our land cover map, a 300 m spatial resolution can be reached in a large part of the study area. Thanks to 8 years of SPOT vegetation data, the pattern of rural complex in Cameroon, Eq. Guinea, Gabon, are better captured than in GLC 2000 (see figure 9).

Globcover is using the same Meris dataset, so the spatial resolution is similar but Globcover is a global and automatic project. Moreover, the Meris data did not allow overcoming the important cloud cover over the forest in Cameroon, Eq. Guinea, Gabon. Our new land cover map allowed designing a land cover legend that is better adapted to the specific vegetation present in the study area and to map more precisely the boundaries of the rural complex near the Atlantic coast (see figure 9).

For other products mentioned in Table 1, some are not covering the entire region of interest, others are more than 10 years old.

2.

Part 2.3 aimed to describe the study area in a general way. We could specify it as “a large part of the study area is covered by tropical forest, known as the Lower Guineo-congolian forests. . .” or we can move this sentence to part 4.1.

A large variety of land cover descriptors are mapped, as mentioned in the legend in Table 3, some are forest types land cover classes other are savannas. Maybe the “forest types map” appellation is confusing? We choose this appellation because the focus was made on forests. But we are indeed mapping not only forest classes.

3.

The spatial resolution of the two dataset used are mentioned in the top of section 3.1,

BGD

9, C4031–C4037, 2012

CC BY

1km for SPOT VEGETATION and 300 m for Meris. The resolution of the map is 300 m except for zone CW (Figure 1).

For REDD, please see the answer to reviewer 2.

4.

In Hansen 2008, they mentioned also “A recent global study of the availability of cloud-free MODIS data for compositing indicated that equatorial Africa was one of several regions affected by high cloud cover at the time of MODIS overpass (Roy et al., 2006). Âż In comparing their product with GLC 2000, Âń Regionally, the area of greatest disagreement was in the heavily cloud-affected regions nearest the Gulf of Guinea in Cameroon, Equatorial Guinea, Gabon and the two Congos.”

5. Check English on line 14-15 of page 7507.6.

Done

6.

These dataset are used in the labeling phase (p7510). The clusters are labeled according to the proportion of the landcover of other maps. Or they are used in an informative way, to illustrate what kind of vegetation is present in the area.

7.

See above

8.

Will be modified in the highest

9.

On line 19-20, we explain that the clusters produced were labeled by referring to existing land cover map. This method was already used in the Globcover intiative, that is why we are referring to Defourny et al. 2009.

BGD

9, C4031–C4037, 2012

10.

See answer to reviewer 1

11. What are the '...' on line 21 on page 7523. Deleted.

Interactive comment on Biogeosciences Discuss., 9, 7499, 2012.