Interactive comment on "Age structure and disturbance legacy of North American forests" *by* Y. Pan et al.

Anonymous Referee #1

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The manuscript discusses the age structure and disturbance legacy of North American forests based on new age map of North American forests. This map was constructed by assimilating forest inventory, remote sensing and fire data for most of the continent. Although I'm convinced of the need and usefulness of the underlying map, I have some problems with the presentation of the manuscript. The making of the map is hidden in the appendix whereas the manuscript emphasizes its potential use. I may be mistaken but I believe most of this community is convinced that such a map is useful. However, part of the community, including myself, needs to be convinced that crown reflectance can be converted in a meaningful 'age structure/disturbance legacy' map. This paper convinced me that the current product is of good enough quality to be applied at regional and continental scale and therefore, I recommend publication of this manuscript. Nevertheless, I see some opportunities to strengthen the presentation and content of

the paper.

I would like to see the methodological appendix moved forward in the manuscript as this part represents the progress made by the team. I'd like to encourage the authors to prepare a figure or table that shows the data assimilation process at a glance (including the similarities and differences between Canada and the US). This section should end with a reference or url where the map can be obtained and the conditions for its use by others. Because the authors advertise the potential of their map (section 3) it should be made available to the community (or clearly stated that it is a commercial product).

I would like to see that the discussion mentions that, for the moment, there is no way to directly measure age through remote sensing. Unless, I'm mistaken, age is derived from a series of relationships that link canopy reflectance to age. Hence, it would be informative to cite some results for the measures of classification success (i.e. remote sensing age vs inventory age).

Section 2 contains a qualitative validation of the age map. Currently, part of the discussion seems speculative (i.e. frequent use of the words 'may' and 'likely'). Therefore, I would like to see a clear separation between the features of the histograms that are really confirmed by historical facts i.e. the colonization, abandoning of farm land, fire suppressions, rise and fall of wood industry, establishing large protected areas, etc. and the features that are not well understood 'episodes of large fires'. Along the same lines, the authors could make a concluding statement for each region quantifying how well the age structure of this can be explained. This could help to identify regions where land-use history is poorly understood or regions where the data assimilation is poor.

Section 3 demonstrates the potential use of the map. Although I agree with the authors that specifying potential use is an essential part of this paper, I find this section too wordy and find the examples not extremely informative. In my opinion a single example where you compare a regional sink estimate without to an estimate with age structure and disturbance legacy would more convincingly show the importance of this type of

information.

Specific comments -Page 983 line 19. There seems something wrong with the age classes -Page 988 line 18: Figure 1 does not contain any information on dryness or fires as suggested by the reference. -Page 991 line 20: NEP and carbon accumulation are not the same. Following the data, you mean NEP. -Page 992 line 21-23: In my opinion, this could only be concluded from an NBP map, not from an age map. However, if this can be concluded from an age map, please, explain. -Page 996 line 20-23. This claim is too strong. I did not find any evidence in your analysis that age is an indicator of successional status after disturbance (in my opinion it was even one of the assumptions of this study). The link to NEP was established in Smith et al 2006. However, I fully agree with the claim the map could improve analyses and models. -Do you need to show Tables 2a & b? This information seems to be presented in Smith et al 2006. -The lay-out of Figures 4 and 5 is poor. Table 3 clearly shows the different regions. Make a matrix of plots and refer to the regions in the plot title. Plotting the histograms on top of a geographical map does not add any information especially because the geographical map is almost entirely covered by the histograms. - What is the difference between Fig 6 a,b and Table 2 a,b? - Fig 7, use a uniform lay-out for your maps. I prefer the style of Figure 1.

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