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Interactive comment on "Bimodality of woody cover and biomass in semi-arid regime" *by* Z. Yin et al.

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The manuscript "Bimodality of woody cover and biomass in semi-arid regime" by Yin et al. reveals a very interesting analysis of distribution of tree cover in the precipitation space. The research follows the study by Hirota et al. (2011) but with a focus on a region with a relatively narrow range of precipitation in central Africa. The authors found that savanna and forest could co-exist for the same precipitation regime, and illustrate how vegetation structure (horizontal vs. vertical leaf extent) could affect the bistability. The study combines analysis of observations with modeling experiments, which makes the paper very informative but difficult to read (see comments below).

Major comments.

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1. I found the representation of the modelled tree fraction on the figures 7-9 confusing. It is difficult to understand what are the color lines on the plot. Are they trajectories of the model simulations with particular D value? What does their projection on the x/y axes mean? If it is a singular realization of the model, how does the PDF distribution done at the plots at the top? Why the end of the color lines on the density plots does not coincide with the ending of lines on the phase plane? Besides, in the color legend in the upper right corner, I missed a label "D".

2. How was landuse accounted for in the observation analysis? This is an important question, because deforestation considerably modifies the tree distribution in the climatic space.

Minor comments.

1. Paper title: I found the term "semi-arid regime" confusing. What do you mean by "regime" here? Could it be replaced by "region"? Also, could you specify the geographical region of analysis in the title, e.g., "central Africa", to make it clear that it is not semi-arid regions from the other continents.

2. Paper abstract, l.7-8: "the simultaneous occurrences of savanna and forest states under different precipitation forcing." Is it "different precipitation" or "the same precipitation"? If it is different, what does "simultaneous occurrence" mean?

3. "tau" parameter is defined twice as a time scale of litter decomposition (p.89, line 2) and the shoot-total biomass ratio (p.89, l. 18). The later parameter should be noted by a different symbol. It leads to a confusion in Fig. 10, where a sensitivity to "tau" is presented.

4. The shoot-total biomass ratio is fixed to a value of 0.45 (p. 89, l.22). While it is a reasonable value for the shrub ecosystem, it is too low for the forest ecosystems, and it is too high for grasslands.

5. When you are talking about the "vegetation continuous fraction" (VCF) product

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(Hansen et al., 2003), could you please specify the version of the dataset you have used here. Also, sometimes you call it “tropical tree cover” product (p. 84, l.23), sometimes “woody cover” product. Please be consistent in the terminology.

6. p. 96: discussion of clusters – could you please draw boundaries of these clusters on the figure to make it clear to the reader what exactly do you have in mind?

Interactive comment on Earth Syst. Dynam. Discuss., 5, 83, 2014.