Biogeosciences Discuss., 7, C2187–C2192, 2010
www.biogeosciences-discuss.net/7/C2187/2010/

Biogeosciences Discussions

Interactive comment on "Modelling burned area in Africa" *by* V. Lehsten et al.

Anonymous Referee #2

Received and published: 4 August 2010

Review of 'Modelling burned area in Africa' by Lehsten et al.

The paper describes how African burned area is simulated with a statistical model that uses 1) climatic data and other sources of information (vegetation density, population density) or 2) only climatic data. The outcomes are compared to remotely-sensed data. The model that includes the other sources of information has a higher predictive skill, and captures about 50% of the burned area variability.

The model nicely fits the scope of Biogeosciences, but it requires a substantial amount of work to make it suitable for official publication. Please find a long list of comments below that need to be addressed. In short, I found the paper to be hastily written, lacking details, and lacking a balanced discussion on strengths and weaknesses of the model.

P4386L2: 'vegetation', please be more precise: vegetation density, type, productivity?

P4386L4: models: it looks you developed one model, but with two modes regarding amount of input data. If you wish to use 'models' instead of 'model', please add '2'. These things sound far-fetched, but it helps the reader a lot if (s)he does not get confused when reading.

P4386L9: Later I learned tree and herb cover are only available for the year 2001, not for the full period as you state here

P4386L15: A value of 10E4 will only mean something for those who have worked with the Nesterov index before, please add some text on what this value indicates.

P4386L21: 0.71 model -> 0.71 for model

P4386L24: this is far-fetched and requires at least some extra text. In the main text you state that total precipitation does not change, so there could be a compensating effect. I will get back to this later, but to make these conclusions a more detailed analysis than currently provide is required.

In general, the abstract requires some text on uncertainty and shortcomings. You capture about 50% of the variability (R = 0.71), what about the other 50%? Model shortcomings, data shortcomings?

P4387L5: wildfires activities -> wildfire activity

P4387L6: this may be misleading; carbon emissions from fires are not the same as carbon emissions from fossil fuel burning as the former may be balanced by regrowing vegetation

P4387L20: please rephrase this sentence

P4387L23: please delete 'some' or identify what you mean (twice in this sentence)

P4388L1: calculation e.g. -> calculation of, for example ...

P4388L17: please indicate what you mean with 'vegetation'.

BGD

7, C2187–C2192, 2010

P4388L21: please separate into 2 sentences

P4389L1: what do you mean with 'over the full availability'? I think you can leave this out

P4389L18: parameter -> parameters. Does this impact the performance of your model negatively? Please elaborate.

P4390L4: the 1st April -> the 1st of April or April 1st. Same for March

P4390L11: We used the burned area data MCD45 -> We used the MCD45 burned area product.

P4390L12: Why annual? The data is available on a daily step, or weekly if you take uncertainty into account. You predict burned area also on a higher temporal resolution, would make sense to compare modeled and measured data at this temporal scale

P4390L27: not sure what you mean here, please elaborate

P4391L9: there are reasons for this large range and it could be accounted for (see Giglio et al. 2006), on the scale you work uncertainties will be smaller than you want the reader to believe here. Burned area products are preferred above fire hot spot data though, fully agree.

P4391L17: parameter -> parameters

P4391L21: most often the grass layer is assumed the main fraction of the fuel load, so please rephrase so it comes first.

P4392L14: not -> no

P4393L21: why not a moving fire season? With the definition now you do not handle the propagating timing of the fire season; in October rain has started in Angola while in Madagascar it is still raining in May. This will impact your analysis of interannual variability

BGD

7, C2187–C2192, 2010

P4394L3: The Nesterov index was developed for northern regions where temperature is an important factor. THis is probably not the case in Africa, please elaborate why you still chose this index

P4393L24: Hovemoller -> Hovmoller

P4396L3: paramter -> parameters

P4396L9: .... and subsequent paramter estimation. Please rephrase

P4396L23: 21th -> 21st

P4398L5: 'well'. Not sure, from the figure it seems burned area in all major biomass burning regions are underestimated. In combination with the underestimation of the satellite burned area as mentioned in the paper this points to a serious error in the model. This makes me wonder: you report an R of 0.71, so about 50% of the variability. Is the absolute value somehow included in this estimate, or just the variability? I am asking this because in the beginning I was impressed by the 0.71 (50% of the variability), but when looking more closely at the figure (most importantly 4, which I think is the absolute value instead of the standard deviation as mentioned in the caption) the underestimation makes the model look worse. I may be missing something here.

P4398L13: not only the evaluation dataset but the full dataset -> not only the evaluation dataset but also the full dataset

P4399L4-7: please rephrase

P4399L7: it would be good to quantify this. I have a several issues with the statement that fires burn in the beginning of the season, most importantly: 1) are these model results? If yes, then please be careful with this statement because readers will think that fires in general burn in the beginning of the dry season. In figure 9 you show (for one grid cell) that the model peaks earlier than remote sensing indicates, so your modeled results may not be good enough to make these statements 2) the nesterov index increases over time, so although the red colors are more striking in figure 7, they

BGD

7, C2187–C2192, 2010

actually indicate the 2nd half of the fire season.

P4400L2: 'good agreement'. I would not rate this as 'good'; the peak is at least one month too early and the second half of the fire season is poorly captured.

P4400L17: This part is confusing. If the total precipitation remains the same AND the Nesterov index increases then there is a redistribution of precipitation. This needs to be discussed and visualized because it is the basis for your statements about future fire activity that is the most novel part of the paper.

P4401: the Discussion section is long and would benefit from being better organized using subsections

P4401L1-8: this is an excellent section

P4401L15: I would not rate the performance 'well'; you state elsewhere that the model does a reasonable job, this seems a better term

P4401L16: these kind of analyses actually perform better with decreasing resolution because several factors usually average out. So I found it difficult to see this was used as an explanation why the model did not perform perfect.

P4401L23-24: please add a reference or elaborate, so the term 'probably' can be deleted.

P4402L16: an at least an -> at least an

P4402L27: e.g. -> (e.g.

P4403L8-11: That may be true but is population density a good proxy for the number of human ignitions? Everybody agrees that fires can be set in deserts or during the wet season in a tropical forest, clearly climate is important. But in the climate zone where fires occur, humans may be more important than you suggest. As long as you cannot explain the majority of the variability with parameters other than humans, there is a chance humans are more important than climate.

BGD

7, C2187–C2192, 2010

P4403L19: are confirmed -> confirm

P4405L1: I do not understand this statement; as far as I know all DGVM studies (e.g., Venevsky, S. Maksyutov,S. (2007) SEVER : a modification of the LPJ global dynamic vegetation model for daily time step and parallel computation Environmental Modelling and Software 22, 104-109) somehow use a Nesterov index and thus have a higher time step than annually.

P4405L5: The found -> They found

P4405L20: Again, this requires a more thorough regional investigation because the decrease in burned area is not expected when precipitation remains constant.

P4405L25: Why not compare to the burned area dataset you used? And matching burned areas seem difficult to reconcile with figure 4c where the model seems to underestimate burned area in all major fire regions.

P4406L17: Good to see the discussion here. This needs graphics to be backed up though, now it remains speculation.

P4407: The conclusions section should be expanded in my opinion to a condensed discussion section and include quantitative information and some text on uncertainties.

Fig. 1: By painting everything below $\sim$3% white a lot of fire-prone areas areas are masked. It may be better to set this threshold lower. This also applies to the other maps

Fig. 4: caption wrong: these are absolute values, not standard deviation. No description for panel C

Interactive comment on Biogeosciences Discuss., 7, 4385, 2010.