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Interactive comment on "Understanding the effect of fire on vegetation composition and gross primary production in a semi-arid shrubland ecosystem using the Ecosystem Demography (EDv2.2) model" *by* Karun Pandit et al.

Anonymous Referee #1

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Review of Karun et al. : Understanding the effect of fire on vegetation composition and gross primary production in a semi-arid shrubland ecosystem using the Ecosystem Demography (EDv2.2) model

Overview: This study uses a dynamic vegetation model to quantify the impact of fire on GPP in a shrub community. The model is somewhat able to represent observed patterns in vegetation and GPP dynamics after fire. However, I find the manuscript to be somewhat immature, with pieces of the methods section in the introduction, unsatisfying basic description of model parts which are relevant for this study, missing

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information in figures etc. and especially a lack of a clear science question or hypotheses to be tested. While I agree that it is worthwhile to improve shrub representation in DGVMs and how these interact with fire, I don't have the feeling the present study takes advantage of the DGVM to ask questions beyond what is known regarding basic impact of fire on sagebrush communities.

Comments

Line 51-71: why would you want to describe the model in this detail in the introduction? This section clearly needs to be moved to the methods. It also needs to be expanded so that one can get a basic idea what the model does, what the fire model does, what happens with the vegetation when a fire occurs etc.

L72-78: Why are you only interested in the effect of fire on GPP, as this is probably the variable where you expect least change through time as vegetation generally is replaced or regrows. In the abstract you mention changes in fire frequency, but you don't follow up on this in your objectives and analysis performed. Probably changes in fire frequency might have an impact, possibly on (soil) carbon, or impact vegetation competition through feedback through the N-cycle, etc. To be clear, I don't say you have to do other analysis, but after reading the manuscript I still wonder why you focused on GPP and no on other aspects of the system which be as relevant.

L 83: Can you give the range in mean temperature and precipitation?

L105: indicate which reanalysis data was used for downscaling using WRF.

L121: Does this mean you don't perform a spinup? How does this work with the N-cycle (which you seem to model, based on what you say in the introduction).

L142: Trends doesn't seem to be the right term, temporal dynamics in GPP? There should exist some literature on vegetation dynamics after fire for these vegetation communities so that you can have an indication whether your simulations capture vegetation dynamics.

L156-157: You don't explain what the driver in the model for this lower GPP with increasing shrub cover is.

L163-164: why didn't you use actual reanalysis forcing so that you can compare interannual variability. Like that one could also assess model performance in figure 4.

L169-170: why? E.g. a fire will burn a shrub immediately, so why would GPP be lowest a couple of years after the fire. When reading this, one wants to know why this happens. Maybe put biomass and GPP for each pft though time in a time series plot or so.

L179-180: I am sorry, but I barely see any difference in delta NDVI between the burned and unburned areas. This is not very convincing, and it almost seems as if there is more of signal from the interannual variability in NDVI due to climate variability then a real fire signal. This entire analysis is a bit shaky; e.g. why do you take GPP for one single day instead of the mean of the month, which should be more representative of hence compare better with NDVI? And possible show the modelled delta GPP between a run with and without fire, instead of comparing between years, so that you only have the fire signal in your simulation results (now one cannot know what is the impact of climate and what is the impact of fire). It would also have taken the mean/median NDVI for multiple images to avoid impact of individual images (especially now that so much Landsat imagery is available).

L212-214: Would have been nice to see a comparison between the model and vegetation dynamics though time as given in the literature.

L 235: I don't understand what you want to say with this sentence.

L234: what do you mean with "annual variability"? I think the discussion needs some work to be more focused and understandable.

Figure 1: include lon-lat and scale to have an idea how big your study area is.

Figure 2: include lon-lat and scale to have an idea how big your study area is. Indicate

what that blob of high NDVI to the northeast is, as it is somewhat distracting.

Figure 3: first sentence of the caption is confusing, shrub, grass and total GPP? Is Grass GPP put on top of shrub GPP?

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