Comment on gmd-2021-410

Anonymous Referee #2

Referee comment on "The impact of hurricane disturbances on a tropical forest: implementing a palm plant functional type and hurricane disturbance module in ED2-HuDi V1.0" by Jiaying Zhang et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-410-RC2, 2022

This study examined the impact of hurricane disturbances on tropical forests by use of modeling. Therefore, authors extended the ED2 model by a new disturbance component on hurricanes and an additional PFT of palms, and calibrated the model with the GLUE approach for a forest site in Puerto Rico. With a sensitivity and scenario analysis, authors discussed the uncertainty of their model calibration and demonstrated the impact of forest state and structure before a hurricane event on the recovery of forests. The study is comprehensively conducted and described and the manuscript clearly written. I have a few points to recommend for minor improvement of the manuscript.

General comments:

The relevance of studying hurricane impacts on tropical forests and why modelling is an important tool besides observations should be emphasized more clearly in the introduction, abstract and conclusion. What is your motivation of extending the ED2 model by hurricane disturbances? E.g. in the conclusion (page 20, lines 528-529) you state that no model has implemented hurricane disturbances so far. Please write in more detail about the relevance of such applications. Which benefits can models provide in this context (besides observations)? Few points are mentioned in the conclusion, but the relevance of your study should also be emphasized in the abstract and introduction.

Further, why did you choose the ED2 model? How is it related to other models studying disturbance impacts on tropical forests in general. Please shortly relate your work to the current scientific literature on modeling tropical forests and disturbances in general.

Minor points:

1) page 2, line 31: Can you provide few numbers? How often do they occur on average?

2) section 2.1: I think the general model description of ED2 could benefit from a summarized description of its basic structure. Although you refer to literature references, it is important to have general information on the main processes (recruitment, growth, competition, mortality) also in your manuscript. Especially in section 2.3.2 you mention different mortality sources in the absence of hurricane disturbances and to understand this, already more information in the section on the model description is required.

3) page 5 line 122: Is lambda_d affecting the entire patch or a fraction of a patch?

4) page 6 line 165: Please add the size of a plot. You mention it later in the manuscript (page 9, line 261), but it should already appear here.

5) page 9 line 247: How would this assumption affect your model simulations of long-term studies (e.g. longer than 100 years)?

6) page 17, Fig. 9f: The stem proportion of Mid PFTs seems to still decline (if simulating longer than 112 years; similarly basal area, Fig. 9c) in some scenarios. Nevertheless, you state that the forest reaches a steady state after 80 years (page 18, line 439). How did you determine its steady state? Further, do you have an explanation why Mid PFTs are still declining (in comparison to the other PFTs) and "mostly have small stems" (page 18, line 443-444)?

Specific comments:

1) page 3, lines 51-54: Difficult to understand in relation to the previous sentences. Can you rephrase? (e.g. what is "the initial vegetation condition"?)

2) check some spelling and grammar in your manuscript, e.g. page 4 (line 92, "Since …"), page 4 (line 108, "They then were to use …"), page 10 (line 285-286), page 10 (line 300, "of" is missing after "impact"), page 12 (line 341, "compated"), page 19 (line 479, "AB"), page 19 (line 499, "utlized"), page 20 (line 518)

3) define and describe variables the first time you mention them in the manuscript (e.g. page 4, line 98, H and DBH should be defined including their units)