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**Hydrology and Earth System Sciences Discussions**

# *Interactive comment on* "Hydrological response of a small catchment burned by experimental fire" *by* C. R. Stoof et al.

**C. R. Stoof et al.**

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Overview

REVIEWER COMMENT The MS describes the effects of an experimental prescribed fire on the shortterm (1-2 year) hydrologic characteristics of a catchment in Portugal. The topic area is suitable for this journal and would be of interest to its readership. The research questions posed are relevant and justified based on the literature review. The paper is very well written, the methods are robust and the conclusions are generally reasonably supported by the data.

AUTHOR RESPONSE Thank you for the compliments



Specific comments

REVIEWER COMMENT The authors state in the abstract and the introduction that "catchment scale studies on the hydrologic impact of fire are scarce". I don't agree with this there are many catchment scale fire effect studies in the literature, especially in the US and recently in Australia. Nested studies are less common, as are European studies, and the authors may be better placed to argue the scarcity of these types of study

AUTHOR RESPONSE Will do

REVIEWER COMMENT Abstract line 5; the authors claim this is a "unique" approach. I think this is a bit strong. The approach taken is very sound, but I don't think it is unique.

AUTHOR RESPONSE We agree – we removed it from an earlier version of the manuscript itself but left it in the abstract by mistake.

REVIEWER COMMENT I like to see more quantitative information in the abstract. If the runoff coefficient changed, by how much? The same is true for statements about water repellence, soil water etc. The abstract is often the first (and sometimes the only!) exposure people have to your paper and it should be as informative as possible.

AUTHOR RESPONSE Thanks for the suggestion; we will incorporate more quantitative data in the abstract of the revised manuscript

REVIEWER COMMENT Last paragraph of introduction; The authors hypothesis is that hydrology is changed due to "canopy interception and water repellence", however the methods then cited in the following sentence only include "streamflow, canopy interception, and soil moisture" Shouldn't the methods include water repellence testing if this is 1 2 of your hypothesis?

AUTHOR RESPONSE Good point. The data collection for this paper was limited to rainfall, streamflow and soil moisture data. Soil water repellency was extensively stud-

ied during the entire course of the study, but is subject of a separate paper (Stoof et al., 2011) This repellency paper describes the methods followed, and the results are cited in the present (HESS/D) paper. We will clarify this in the revised version.

REVIEWER COMMENT The section on data storage and analysis does not need to describe the database, and could include more detail on the ANCOVA.

AUTHOR RESPONSE This is in line with what the other reviewers suggested. We will improve the methods section about the analyses in the revised version.

REVIEWER COMMENT Looking at the streamflow data ie a control catchment and a treatment catchment, with data before and after the treatment was applied, did make me wonder why you did not analyse the data using a conventional paired catchment approach ie determine the behavior of the treated catchment as a function of the control, then compare the predicted behavior of the treated catchment with the observed behavior of the treated catchment. I imagine you have considered this, and if so it would be good to articulate why you did not use this approach.

AUTHOR RESPONSE We did this in an early stage of our data analysis, on daily data. Because the residuals of this analysis were not randomly distributed (due to the large degree of correlation between streamflow on one day and the next), we did not proceed with this analysis and focused on other ways to compare the catchments. When we later worked on the Ancova analysis and found that weekly timesteps were more suited for streamflow analyses at the catchment scale, we omitted to re-check the 'traditional' or conventional paired catchment analysis. Because of your suggestion, we re-ran the conventional paired catchment analysis using weekly data (for which the residuals were randomly distributed). We have incorporated this analysis in the revised manuscript.

REVIEWER COMMENT The canopy interception results were very interesting – I didn't expect such high values. With such high values, and such a large change with fire I feel like you could potentially make more out of this data by maybe considering how much of your observed change in hydrology could be explained by this aspect of the



system (eg. via modeling maybe?).

AUTHOR RESPONSE We agree that the interception results are very interesting, and are currently working on a modeling study of this and other fire-affected catchments that partly focuses on the role of interception.

REVIEWER COMMENT Equation 2 should quantify a lower bound for P so that TF does not become negative

AUTHOR RESPONSE You're very right, we will include a lower bound indeed.

REVIEWER COMMENT In the Streamflow section I had trouble understanding exactly the meaning of the QQ plots (Fig 3); some more detail here would be helpful.

AUTHOR RESPONSE We will add some more detail either here, or in the methods section.

REVIEWER COMMENT Fig 4 c ; I would like to see the data overlaid on this function as it is difficult to evaluate how good it is.

AUTHOR RESPONSE Nice idea, will look into this.

REVIEWER COMMENT Discussion: I really liked the discussion; I think the authors have done a great job to bring together the various pieces of the story into a coherent and plausible explanation of the processes dominating the post fire hydrologic change in the catchment. My only reservation, again, would be that perhaps the authors could make more out of some of the results by modeling the system so as to show in a more quantitative way how some processes dominate the post fire hydrological change.

AUTHOR RESPONSE Thank you for the compliments. As mentioned above, we do intend to model the system in a future paper, and will then try to quantify the importance of the different processes.

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Stoof, C.R., D. Moore, C.J. Ritsema, and L.W. Dekker. 2011. Natural and fire-induced soil water repellency in a Portuguese shrubland 75 (6): p. 2283-2295. Soil Science Society of America Journal.

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