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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Forecasting wind-driven wildfires using an inverse modelling approach" *by* O. Rios et al.

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This manuscript presents a data assimilation technique applied to wildfire spread (Rothermel's model plus Hyugens' principle). The study is inspired from other works in fires, both in the build environment and in the open. It is preliminary in nature and somewhat less advanced than others found in literature. However, it contributes nicely to this new approach of wildland fire spread modeling through a thorough analysis of the data assimilation technique that focuses on the costs and benefits of the approach.

I recommend it for publication but the authors need to address the following comments:

- The study is not well positioned in literature. Particularly, the study of Rochoux et al. is succinctly described but it is not clear how this work complements it. The approach

by Rochoux et al. also integrates measurement errors whereas this study neglects them. This is true for the other cited works.

- The work by Coen and co-authors should also be cited and commented (see: Coen, J. L., and W. Schroeder (2013), Use of spatially refined remote sensing fire detection data to initialize and evaluate coupled weather-wildfire growth simulations. Geophys. Res. Lett., 40). This last study also raises the issue of the scale at which data assimilation techniques would be efficient. Small-scale experiments and large-scale fires are less sensitive to sudden variations in the parameters. This statement tempers the statement in the introduction about the paradigm shift, which would be limited in scope and application.

- I do not believe that the solution to improve this work is to use much more complex models, like CFD-based fire spread models. It is obvious that a bigger number of parameters will make the model more flexible to data assimilation but the limitations will come from the measurement issues and the possibility of getting relevant results. Mandel et al. already found fake results with a reaction-diffusion model. I think that the focus should be made on the simplest relevant (to wildfire spread) model that allows getting satisfactory results at the selected scale.

Some minor corrections need also to be made:

- The formulation "inverse modelling knows the output" is not very rigorous.

- In the conclusions: "powerful" is more an opinion than a scientific statement. Spell "height" instead of "hight".

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