Review of the manuscript "Evaluation of WRF-SFIRE performance with field observations from the FireFlux experiment"

General comment

This work present simulation result of the couple fire-atmosphere model WRF-SFIRE. The evaluation of the model is made by comparison with the well-documented prescribed burn named FireFlux described in Clements et al 2007 and 2008.

The manuscript is organised as follow: first, (i) a brief description of the model and the modifications implemented for the purpose of this test case, (ii) a description of the FireFlux experiment, (iii) a comparison of the simulation results with the local measures collected during FireFlux, (iv) a discussion on the 3D structure of the fire front propagation, and (v) finally a series of comment on prescribed burn plan.

I found that the paper is clear and present clearly the output of the work. It is an evaluation study of the model and not a validation. The discussion on the 3D structure of the model is interesting, and the fact that WRF-SFRIRE reproduces similar fire behaviour as the model FIRETEC is encouraging.

However I would have some comments on the comparison with the FireFlux measures, which is relatively long and difficult to read. For sake of clarity, I think that the comparison would be easier to appreciate if organised by point location (e.g. plume behaviour at the main tower and the short tower) rather that by measurement (e.g. temperature, horizontal velocity, vertical velocity).

I have no major concerns and recommend publishing the manuscript in GMDD. Below, I listed some comments, which I hope may help to improve the quality of the manuscript.

Specific comment

123-l12: "A major difficulty in developing realistic wildfire behavior prediction ..." this sentence could be the start of the following paragraph rather than the conclusion of the one it is ending.

125-l14: "making it", I might be wrong I was expecting "making them"

125-l19: "fire front propagation" instead of "fire-atmosphere interaction". The fire-atmosphere interaction is one component of the fire front propagation.

125-l25: "provide details of the 3D plume structure" rather that "recorded the state of the atmosphere"

126-l5: "evaluation" rather than "validation"

section2: is that possible to give more information of the location of the sonic anemometer.

section3: I had difficulty to understand how the heat is release in the WRF atmospheric cell. Is this depending of the values of the local ROS, or is it a constant?

127-l19: "the fuel is assumed to decay exponentially with time". Here, do we need to understand fuel consumption?

128-l27: The author mentions "no-Fire" runs in the discussion section. Do we know if subgrid turbulent scheme of WRF-LES is validated for a resolution of 10m.

130:l13-14: Here it is just a comment. The no wind ROS or flank fire is mainly driven by radiative transfer which are not resolved in the SFIRE model. As discussed in the final section of the paper the authors are considering implementing other fire propagation model. It could be interesting to consider a fire model which can transport ROS and Fire Intensity (see Tymstra et al 2010 for a description of the Prometheus fire model of the Canadian forest service). Such quantity can be related to fire radiation and may be used to derive local value of "no-wind ROS".

131-l10 and around: the description of the available thermocouple is not clear. May be a list of the available temperature data would be clearer.

131-last sentence: This sentence would fit better in the discussion section.

Section 5-1: Is this really ROS that is described in this section? ROS characterizes the fire front propagation. Here the author shows time series of local temperature around 5m agl. It looks more like residence time and/or arrival time, though it is not temperature at ground level.

133-l25: suggest revising, "coarse" instead of "course"

134-l1-5: Is it realistic to compare plume temperature close to the ground? Radiation might still be relatively important, and soot particles present in the plume are heated by the underlying combustion zone. The WRF-SFIRE system is not solving radiative transfer; therefore the model is likely to underestimate temperature near the ground.

134-l28: consider revising, "and measurement" is "remarkable".

135-l24: consider revising, "the fire" front "thickness"

Section 5.3.3: I had difficulty to find information on the fire line ignition location in the WRF grid. As the x,y and z direction are used in this section, you might consider mentioning here the location of the fire ignition line and the fire front propagation direction, or wind direction.

140-l11: consider revising, "y-z cross section" instead of "x-y cross section"

140-l11: "x=465 m" is that the x-coordinate of the masts?

141-l1: could you consider defining what is the "fire induced circulation"?

142-l26: ERR refers in the manuscript to value in MW and MW/m^2. (see 141-l20)

144-l6: consider revising, "y-direction" instead of "x-direction"

146-l10 and around: such a statement is may be too general when only considering evaluation of the model on fire propagation over grass. If the objective of WRF-SFIRE is to be operational, situation of forest fire and crown fire have to be considered. In such a case, the fire behaviour is going to be relatively altered and radiation might play a more important role. Capturing the dynamics of the fire front propagation in an inhomogeneous forest of pine trees with a 10 m grid cell and no radiation might be much more challenging.

149-l15: As mentioned in the manuscript, the fire and plume behaviour near the ground is more affected than higher in the atmosphere. Therefore we can expect the simulated fire to be less realistic near the ignition. I understand here that the evaluation could not be made only on the ST data, as many instrument failed during the burn, and that most of the available data are coming from the MT. Nevertheless earlier in the manuscript (i.e. in section 6), it would be interesting to have information of the variability of the steady state of the fire when reaching the ST.

Figures:

Figure 10: In the plot, both MT and ST are marked with a diamond, while the legend mentions a triangle for MT.

Figure 14: same as above

Reference:

Tymstra, C, Bryce, R, Wotton, B, Taylor, S, Armitage, O (2010) Development and Structure of Prometheus: the Canadian Wildland Fire Growth Simulation Model. Northern Forestry Centre, Edmonton, Alberta Canada.