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Biogeosciences Discussions

Interactive comment on "Varying relationships between fire intensity and fire size at global scale" *by* Pierre Laurent et al.

Anonymous Referee #2

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This manuscript is interesting and fit well with the focuses of BG. It can be published after a careful revision. I am not a fire ecologist. Consequently, I met a lot of difficulties in understanding concepts, variables names and their definitions you used in the manuscript. The guiding principle of your analysis is the Rothermel (1972)'s fire spread model ("Rothermel's equation" line 35, "Following the hypothesis from Rothermel's equation of fire spread" line 170). It is a very detailed local scale model. It is one of the most used models to simulate the forward rate of spread at the front of a surface fire, and is the primary fire spread model applied in many fire prediction systems. In the Rothermel's model, rate of spread is simulated as a function of topography, microclimate conditions and a fire behavior fuel model or fuel model that consists of numerous parameters for a given fuel complex. Standard fuel models have often been shown

inappropriate for representing local conditions. In this manuscript, you referred to the Rothermel (1972)'s equation. In the original USDA paper, the number of equations was c.a. 90. It will be fine that in your up-scaling procedure, from local to global, you explain how you summarized the Rothermel (1972)'s fire spread model for finally analyze the relationship between fire patch area and fire intensity. A short explanation will be useful and will clarify the discussion in which you mixed: fuel biomass availability, biomass gradient, moisture content of the fuel, fragmentation, wind speed, fuel bulk density, fuel load, etc. My second main concern is your cutting of continents by using the one proposed by the GFED. The 14 regions are very arbitrary. As an example EURO includes the surrounding of the northern part of the Mediterranean Sea where the fire regime surely doesn't follow the same pattern than in more Northern regions. Likely using a more "ecologically-based" or "climatically-related" cutting will yield contrasted results?

Line 23 plant biomass distribution. Line 25 rather ecological driver than climatic variable. Line 29 reliable burned area, active fires and fire intensity global dataset. Line 45 fire patches vs raw burn area. Please could you explain? Line 54 please define BA here (burned area). Line 62 please detail MCD14ML. Best to give the complete name of the remotely sensed products you used and their DOI if available. Line 76 fire patch size why not fire patch area? Line 74 "validated against Landsat fire polygons". Line 77 Standard Deviation Ellipse (SDE) Please could you explain how this parameter calculated? It does not seem further used in the manuscript except lines 87 and 89. One SDE covers approximately 68 percents of the fire patch. You applied a cutoff at SDE + 1 km, why not 2 SDE? Line 90 30-day buffer seems very long. During this delay surface reflectance may drastically change with resprouter shrubs or some bunchgrasses. Line 95 you wrote "In this analysis, we used FRP as a proxy of fire intensity, later called FI". Further we still found FRP in the text and in the graphs. Line 112 "Brazilian tropical savannas". On fig 1b, most red dots are located across Argentina and not across Brazilian tropical savannas! Line 125 please define the meaning of GFED. Please use the full names of the regions in Table 1. Line 126 fitted rather than interpolated. Line 130 humped relationships in CEAM, EQUAS, SEAS. This type of

“humped” relationships seems to occur elsewhere? You presented these three areas as equatorial biomes. This means closed to equator or with a particular climate pattern? (See my previous comment on your geographical cutting). Line 139 MW-1 Line 206 percolation or cellular automata? Figure 2 FI in the figure legend and FRP in the x-axis. Y-axis scales drastically change depending of geographic area and so complicate the reading. Figure 3 are you sure that this figure is necessary (see Table 1 content).

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