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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Calibration of FARSITE fire area simulator in Iranian northern forests" *by* R. Jahdi et al.

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Reviewer #2: General comments

This is a very interesting paper focusing on a topic, which is undoubtedly highly relevant. The manuscript is generally well structured and correctly written. However, some parts are a little bit vague, confusing, or even incorrect, and should be rewritten.

Throughout the manuscript, many aspects need to be further explained and many decisions or assumptions have to be further justified. The methodological approach that was implemented is generally correct, although its explanation is not always clear enough. Moreover, some aspects of the calibration process could probably be improved exploring some complementary approaches. Some methodological aspects

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are too ambiguous and need to be better explained. In particular, the section devoted to Fuel mapping and fuel model assignments is often ambiguous. The authors have to explain PRECISELY their field sampling work and which vegetation data they collected. They have to show the quantitative values of the vegetation variables that they sampled and explain how they used the vegetation data (either collected on the field, or from the bibliography) for updating the available land cover maps and deriving suitable fuel model maps. Some methodological choices are not sufficiently justified and this lack of explanations makes some of the decisions or approaches seem a little bit daring or even risky, sometimes.

The discussion is rather poor and has to be improved.

In synthesis, I would support the publication of this paper, if some major revisions are correctly performed.

Thank you for the comments. We improved the manuscript taking into account the points highlighted.

Specific comments

Introduction -Page 2, lines 34- 35: This first sentence is too vague and those “losses” are not enough explained. The text should be more precise. We rephrased the sentence

-Page 2, line 36: Your reference (i.e. FAO, 2005) is rather old. Can you find something more recent? Done

-Page 2, line 37: It would be interesting to know how much this 7% represents over the total area of Northern Iranian Mountains. We rephrased the sentence. A more detailed presentation of Northern Iranian Mountains is provided in Material and Methods

-Page 2, line 42: If all the species you cite do not fit in ALL categories (i.e. protected, endangered and endemic animals), you should replace “and” by “or”. Done

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-Page 3, line 43-50: In my opinion, this paragraph is too long. We shortened the paragraph.

-Page 3, line 58 and line 61: Other references should be cited. Done

-Page 4, line 87: The concept of “fuel model” (and of “surface fuel models”, in particular) should be briefly explained. Done

-Page 4, line 88: The sentence is not correctly expressed. The maps do not “derive” from GIS, or from remote sensing. A GIS is rather used to prepare (or adapt) the required spatial information. Besides, canopy-related data may be provided to FARSITE as constants and are not required as spatial inputs. We removed the reference to GIS and remote sensing

-Page 5, line 90: What does “quality” mean exactly here? You need to me more precise. The sentence was rephrased

-Page 5, line 91: “Although data availability increased during the recent years, ...” Where? Every where? Also in your areas? This is a statement we consider correct (considering tools like Google Earth, or satellite images, research papers, and so on), although data availability increased nonhomogeneously worldwide -Page 5, line 94: “. . .mapped vegetation attributes”. Are you sure that “attributes” is the suitable word here? The word “attributes” was replaced by “characteristics”.

-Page 5, line 94: ”In the last years. . .” seems unsuitable here, since you cite Anderson (1982), published 32 years ago! Done

-Page 5, line 98: “. . .. local vegetation complexes or fuel type’s properties”. What do you mean exactly? It is not clear enough. Be more precise. We corrected the sentence.

-Page 5, line 102: “We tested different standard fuel models...”. The text is a little bit confusing. You don’t explain clearly if you intend to compare these 2 sets of standard fuel models, or rather to compare pairs of standard fuel models (mixing both sets). We tested different standard fuel models for each case study, and we defined the best

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combination of models which allowed to maximize the simulated perimeter accuracy . The goal was not to compare Scott and Burgan vs Anderson fuel models.

-Page 5, lines 107-108: The last sentence of this paragraph is written as if it was a part of your discussion or conclusions. It should be rewritten. We do not agree with this comment. The sentence highlights one of the expected values of the work, which should be presented in the introduction section, as suggested by several international journals.

-Page 5, line 108: "... for several fire management purposes". It is too vague. We removed "several"

Materials and Methods Study area -Page 6, lines 117-130: You should indicate the altitude range of the Siahkal forest area as well as the average annual temperature and maximum temperature. We added the altitude range of the Siahkal forest area and the average annual temperature.

-Page 7, lines 139-142: You have to indicate the most representative and abundant species of each vegetation type you cite. This information is provided in Table 1; we added the reference to the Table 1.

Wildfire history -Page 7, line 145: Is this average annual area burned? Be more precise. We rephrased the sentence.

-Page 7, lines 145-147: But Figure 2 that you cite shows the figures for your 2 study areas and you were speaking about "northern Iran" in the previous sentence? It is confusing. Be more precise in relation to the area(s) that you comment all through this paragraph (lines 144-153). In the first paragraph of "Wildfire history" we described and gave statistical data for the northern Iran in general and then, in the second paragraph, we gave specific data corresponding to both study areas. We moved the sentence describing the annual fire number and burned area in the study areas to the second paragraph.

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-Page 7, line 148: A reference should be cited after ". . .fuel accumulation". Done

-Page 7, line 149: Which "area" are you referring to? Be more precise in relation to the area(s) that you comment all through this paragraph (lines 144-153). We refer to the northern Iran, and therefore also to the study areas.

-Page 8, line 157: Do you mean "average annual area burned"? Be more precise. It would be interesting to know which percentage of that study area is burned each year (the average value). The sentence was corrected.

Case studies -Page 8, line 166: How many FARSITE simulations did you perform for each experimental case? This is not explicitly said in the Methods, although it seems (based on Figure 7) that you only performed one. Is it correct? Do you think that it is a trustworthy approach? In any case, you have to explain and justify any methodological decision. "Case studies" has the goal to describe the four case studies selected. The number of simulations as well as other methodological aspects are later explained in the "Material and Methods".

-Page 8, line 170: You cite Table 1, but it does not show any quantitative value for any structural characteristic of the vegetation types that are present in your sites. Have you gathered this type of data? You need to describe quantitatively (based on field samplings and/or bibliography) a set of structural variables among those that are usually used in the literature for describing plant communities as fuel models. Without quantitative data, it is not possible to reasonably and accurately perform the reclassification of vegetation types into standard fuel models. Those aspects need to be further and better explained in your manuscript. You need to provide more data (complete Table 1) and give more detailed explanations about your vegetation sampling work. We rephrased the sentence, detailing the measured parameters in the sampling work. Table 1 aims to present a summary of the case studies, and shows the dominant species and fuel types, not the structural characteristics. The fuel models selected for each case studies and the associated characteristics are based on standard fuel models

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(Anderson 1982; Scott and Burgan 2005) and are presented in Table 3. We added new columns in the Table 3 with the "avg. fuelbed depth (cm)", and the "canopy cover (%)".

-Page 8, line 171: "...determined by .....Global Positioning System (GPS) data". What do you mean exactly? We stated that "For all case studies, ignition locations and real fire perimeters were determined by survey fieldwork and Global Positioning System (GPS) data, as well as considering the information obtained from reports and interviews to forest rangers, firefighters and Park managers". The ignition locations and the fire perimeters were provided by the fire and forest agencies as x,y coordinated obtained with a GPS.

-Page 10, lines 211-212: "The fire spread towards north-east driven by moderate south-east winds." Is this correct? It seems more logical that winds are from South-west if fire spreads towards North-east. The sentence was corrected.

Fuel mapping and fuel model assignments In this section, you need to provide more detailed information about your vegetation sampling work (experimental design in detail, detailed list of sampled variables, etc.), but also about the methodology that you applied for combining the vegetation data with the available cartography and the bibliographic information in order to produce suitable and updated fuel model maps. This is not clear at all. This section is too ambiguous and needs to be completed and improved. We rephrased that part of the text to provide more detailed and clearer information about the methodology used.

-Page 10, lines 215-216: "...intensive field sampling and measurements on the main plant communities of the study areas, This part of the sentence is too vague and imprecise. It should be rewritten. The sentence was rephrased

-Page 10, lines 216-217: "... "in combination with the 1:25,000 land-cover maps". What do you mean exactly with "in combination"? You have to explain precisely how you used your field data for updating the available maps. The sentence was rephrased

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-Page 10, line 217: "..the 1:25,000 land-cover maps". We need more information about those maps. We need to know, in particular, when were they produced in each site (not the publication dates, BUT THE field work years). If those maps were produced several years before (or after) the reference fires of your sites (occurred in 2010 and 2011), those maps may be completely unsuitable for your purposes. You should comment all those matters in detail in this section and justify any decision you may have taken due to a limited availability of vegetation (or land cover) maps. We added more details about the 1:25,000 land use land-cover map of Iran. All the land use land cover maps (and the field work years) were produced before the fires occurred by the National Agency of Iran (National Cartographic Center; NCC; http://www.ncc.org.ir; 2004). Field samplings had the purpose of measuring some fuel parameters starting from the land use land-cover maps, in order to improve the standard fuel model assignment. Land use land-cover maps have been successfully used in previous works (Salis et al., 2013, 2014) for the landscape fuel mapping.

-Page 10, line 221: "surface fuel model parameters". Which ones?? Be precise! We added a sentence specifying the measured surface fuel model parameters.

-Page 10, lines 221-222: "canopy characteristics". Which ones?? Be precise! We added a sentence specifying the measured canopy characteristics

-Page 11, lines 223-225: How many plots were sampled per vegetation type? Why? How did you decide their location? Many aspects of your methodological approaches need to be clarified. The vegetation data were gathered in 188 and 250 plots, respectively in Siahkal area and Golestan National Park. We selected 55 plots by 1m$\times$1m size for grass fields and 133 plots by 10m$\times$10m size in shrublands and woodlands in Siahkal area. In Golestan National Park we selected 130 plots by 1m$\times$1m size for grass fields and 120 plots by 10m$\times$10m size in shrublands and woodlands (see Table 3). The plots were randomly identified in the study areas based on random point selections in a GIS environment.

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-Page 11, line 226: “structural stage”. What do you mean? Be more precise. We removed the sentence.

-Page 11, lines 225-229: I find no variables related to either vegetation covers, or aboveground biomasses. . . .?? How did you get, for instance, the information about the different fuel loads for your various vegetation types? As reported in the revised manuscript and in the Tables, the fuel loads as well as other fuel characteristics were set according to standard fuel models. Field sampling was used to determine/measure parameters that could allow standard fuel model assignments to the different land use land-covers. We added new columns in the Table 3 with the surface fuel model data and canopy cover estimated from the fieldwork.

-Page 11, line 230: “The experiences of fire engineers...”. What do you mean exactly? The sentence was removed

-Page 11, lines 229-232: It is very ambiguous. It is not clear AT ALL how this “reinterpretation of the initial vegetation maps” that you mention was carried out. You have to clarify your methodological approaches explaining in detail the different stages of the process. The sentence was removed

-Page 11, lines 233-235: But, apparently, you have not gathered all the required vegetation variables for correctly achieving that. At least, the information does not appear in your manuscript. The reviewer did not consider the information reported in the Tables and in the manuscript, since a clear reference on the standard fuel models used was presented.

-Pages 11 and 12, lines 236-251: This paragraph should be included in the Results section rather than here. Besides, the reclassification of vegetation types into standard fuel models that is proposed should be presented in a Table also. It would be much more understandable and clear. Rather than a result, we are here describing the standard fuel model assignments we used for the fire simulations (see Table 3)

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-Page 12, lines 253-255: As commented before (Page 4, line 88), three of the canopy-related variables (i.e. stand height, crown base height, crown bulk density) ARE NOT REQUIRED by FARSITE in a spatial format. They can be provided as constants and they are often provided in such format due to the GREAT difficulty of obtaining accurate maps for those variables. How did you derive those maps for your study sites based on the rather poor available information? It is not totally correct the statement that FARSITE does not require canopy characteristics in spatial format, although in the user guide the canopy data are indicated as "optional". In fact, ASCII files of SH, CBD and CBH should be provided to FARSITE for the landscape production, particularly in forest areas, where surface fires can originate crown fires and spot fires can be further promoted by intense fires. The use of single constant values of SH, CBD and CBH to characterize the forest canopies is a solution that can be "acceptable" for uniform forests, but not in complex ecosystems like those of the study areas. Regarding data availability, we are aware that these data are difficult to be obtained and mapped, particularly in the study areas. The huge and time-consuming field sampling activity carried out in the last years in both study areas was also performed with the aim to gather such canopy information, in particular for the main forest types of the study areas.

-Page 12, line 257: What is the spatial resolution of that DEM? Added in the text

-Page 12, lines 258-259: It was not accurately explained (see previous comments about page 11). Done in the previous paragraph

-Page 12, lines 263-266: You should provide more information about the steps you followed for applying in your sites the Rothermel's method that you are citing. Moreover, you have to provide in your Annexes the tables corresponding to the FM calculations worksheets (sensu Rothermel, 1983) that you generated in order to obtain the fine dead FMCs. You carried out field work on your study sites. Why did you not gather any fuel moisture data? Did you have any data available in the literature for your species and/or areas? In any case, you need to comment all the limitations of your work in

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your text. We added an Annex with such information. We added a comment on the limitations of such approach.

-Page 13, lines 267-268: In relation to live fuel moisture contents, you are citing authors that worked in the Mediterranean basin in various areas characterized by species, which are very different from those you cite for your study sites. The climatic conditions are of course very different too. Do you think that those data provided for the Mediterranean region can be reasonably used in your sites? If you do, you should justify this decision as well as all the decisions that you have taken in your work. The estimation of live woody fuel moisture contents for the shrubby and tree species were based on literature data from the same species found in Turkey (e.g. different types of Quercus spp. and Cupressus spp. from Saglam et al., 2008), as well as from other very similar Mediterranean sub-species (e.g. Juniperus spp. and Euphorbia spp.; see for instance Pellizzaro et al. 2007, 2011; Arca et al., 2007 and Chuvieco et al., 2011) that grow under similar weather conditions.

FARSITE simulations -Page 13, line 270: As previously commented (Page 8, line 166), you need to say explicitly how many FARSITE simulations have you performed for each experimental case. The list of simulations is reported in Table 4, as well as the accuracy evaluation for each experimental case.

-Page 13, lines 270-274: As previously commented (Page 5, line 102), you need to better explain your approach and objectives. The text "...using different combinations of standard fuel models" is rather ambiguous. The objectives and approach were strengthened in the revised manuscript.

-Page 13, lines 273-274: The text can be improved. You are rather assessing the influence of fuel models on the accuracy of the projections of fire spread and behavior. Done.

-Page 13, line 275: Why the adjustment factors have always been maintained at 1.0? Did you try other values for some simulations and fuel models? If not, please justify

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why. It is an obvious and meaningful way of trying to improve the spatial agreement between modeled and real fires. Based on what we can see in Table 5 and Figure 7, it seems that it is interesting to apply it in some of your case studies, particularly in Yeke-Bermagh. Explore that possibility and complete your results with the new simulations. The sentence was removed. To answer to the reviewer's point, the variation of the adjustment factor for the diverse fuel models could be another approach to improve the accuracy of given fuel models, but will result in too many options to take into account. FARSITE simulations aiming to match observed and simulated fires while testing different values of adjustment factors, and the evaluation of the accuracy of each simulation, is another exercise that will result in a huge effort and in a different paper

-Page 14, lines 290-291: "...is an indicator of the exclusive association between observed and simulated burned areas". If you express it that way, it seems that the Sorensen's coefficient was designed and is only used for that purpose, and it is not true. We are not saying that Sorensen's coefficient was designed only for that purpose. References to other papers that applied the same coefficient in fire spread modeling works was also reported in the text. Therefore, we do think that the sentence is not wrong.

Statistical analysis -Page 13, line 285: But Table 5 only shows the "best" simulations! Your text does not correspond, thus, to what is presented in the table. You should either modify it, or present all the results in another table. Information about the accuracy evaluation for all simulations is provided in Table 4. We then reported more details for the simulations that provided the best accuracy values, for the four case studies presented. We do think that providing all the information requested for all simulations will result in a Table too large and too heavy for the readers.

Discussion This section needs to be completed. Several important aspects of the calibration process and some limitations of your work have to be further commented. Scale issues are not mentioned and should also appear in the discussion. You have to mention at some point that FARSITE is a fire model operating at a local (i.e. land-

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scape) scale (other available models were designed for broader scales), which implies some benefits, but also some requirements and limitations. The discussion section was improved

-Page 18, line 385: "Verification..". What do you mean exactly? Cite other studies having done this. We replaced "Verification" by "Validation".

-Page 18, line 390: Shouldn't it be "calibration and validation" rather than "validation and calibration"? We corrected the sentence.

-Page 18, lines 392-394: You do not comment anything specific about wind data. You should insist on that source of error. As you know, wind data are crucial for fire modeling and in most studies good local wind data are not available. In your study, this issue is not sufficiently discussed. Besides, it is not clear if the wind data provided by the 2 weather stations (data presented in Table 2) are reliable or not. You mention in Table 2 the distance between the weather stations and your sites, but, we do not have enough information about the fine-scale topographic situation of those weather stations and about their dominant winds and if, in each of those 2 stations, the dominant winds have the same characteristics as those prevailing in the study areas. A weather station can be very close to a given area, but still characterized by different dominant wind directions, for instance. You have to provide more information and discuss explicitly about all those matters. We mentioned the importance of both wind field data and custom fuel models to obtain reasonable simulations of fire spread and behavior. Due to lack of data about the wind speed and direction from the first weather station, we used only the data from the second weather station. For this reason, the reference to the Dasht weather station was removed from the Table

-Page 19, line 403: "...can accurately replicate fire perimeters and behavior in our study areas." Do you know precisely what was the spatial distribution of fire behavior variables in the real fires that you have chosen? If you do, you should have commented those data. If you don't, you can't say that, or at least you can't say that in that way,

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and you have to change this sentence in your text. We corrected the sentence.

-Page 19, line 408: "...and fire behavior". See my previous comment. We corrected the sentence.

-Page 19, lines 403-407: "In this work, the main fuel model types and characteristics were initially identified by classifying the vegetation structures combining field sampling data and bibliographic information (Anderson, 1982; Scott 405 and Burgan, 2005). Then, we associated each fuel type to a specific standard fuel model to simulate fire propagation and behavior with FARSITE (Finney, 1998)." This text has to be in the Methods section. We removed this sentence from the Discussion

-Page 19, lines 410-414: "The good agreement between the actual and simulated fire perimeters, as measured by SC and K coefficients, resulted in values higher than 0.69 for SC and 0.68 for K, considering all case studies and the most accurate FARSITE simulations. In more detail, the best FARSITE simulations ranged from 0.69 to 0.86, in terms of SC, and from 0.68 to 0.82, in terms of K (Table 4)." This text has to be in the Results section. This is not a discussion. We added in the Discussion some results that we consider important to strengthen the results obtained, the good accuracy obtained in the outcomes as well as the overestimation expected in most the simulations (since the fire suppression efforts were not considered).

-Page 20, line 426: "...which have high load and height". Have you got this information for the plant communities of your study sites? In the paper I could not find any quantitative data about those crucial variables. As commented previously (Page 8, line 170), quantitative data about a set of structural variables are required to classify your vegetation types as standard fuel models, but that information does not appear in your paper. It is not clear if you gathered it on the field (completing it maybe with data found in the bibliography) or if you did not gather it at all. Clarify those aspects please. According to the reviewer's comments, we improved the description of the activities carried out in the field.

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-Page 20, line 428: The text mentions “fire intensity levels”, but FML refers to flame length. Revise and correct. Since the FML (flame length) is an indicator of fire intensity, as reported by several papers (e.g. Scott 2006; Ager et al. 2007; Andrews et al., 2011), the sentence is not wrong. Anyway, we accepted the suggestion and we made reference to flame length levels.

Conclusions -Page 20, line 437: “on fine scale FARSITE outputs“. What do you mean exactly? Clarify. The sentence was modified.

-Page 20, line 439: “ . . .wide variation “. Again, the precise meaning of your text is not clear. It seems, that you have not described nor analyzed properly this “variability” in your Results section. We replaced “ . . .wide variation “ with “different types “.

-Page 20, line 441: We don’t know if your affirmation is correct, because you did not explain properly those “. . .local vegetation conditions”. (see comments Page 8, line 170 and Page 20, line 426) The sentence was rewritten

-Page 21, line 441: It is probably better to say “defined and mapped” instead of “ mapped and defined” Done

-Pages 21-22, lines 441-442: “...which were mapped and defined combining field sampling activities and 1:25.000 land use maps”. As previously commented (Page 10, line 217), this part of the work is rather obscure and has to be further explained. Besides, we need to know which are the dates of those land use maps (for each study site)? We need to know that in order to know if those maps were updated and appropriate for deriving the fuel model maps and simulating fires of years 2010 and 2011. We improved the description of this point in the Material and Methods section

-Page 22, line 442: “land use maps” were previously named “land cover maps”. It creates confusion. Moreover, it is not necessarily exactly the same. You should choose one unique name and keep it. Done

-Page 21, line 445: “. . .a high potential for estimating spatial variability in fire spread

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and behavior in the study areas." In relation to the fire behavior, as commented previously (Page 19, line 403), are you sure that you have showed that? We can't infer that based on the results you have explained in your manuscript. The Tables presented in the manuscript show the influence of topography and fuels on fire behavior. Also, the FARSITE maps of ROS, FLI, and FML obtained for each simulation took into account the spatial variability of environmental conditions (slope, aspect, elevation, fuel models, etc.). For these reasons, we think the sentence is correct.

-Page 21, lines 452-454: I think those comments should be developed in the Discussion section. You have to further comment the limitations that you faced in your study sites in relation to the available vegetation/land cover cartography (accuracy, dates. . .), but ALSO the limitations of your field work. Then, you can honestly discuss the difficulties for carrying out a suitable reclassification of the vegetation types in standard fuel models. We added the limitations of our work in the conclusion section.

-Page 21, lines 453-454: But ALSO for improving the reclassification of vegetation types in standard fuel models. We added this recommendation in the conclusion.

References -Page 29, lines 629-631: The indicated date is not correct. Done

-Page 29, lines 632-636: The reference is not complete. Done

III) Technical corrections -Page 2, line 38-39: "as well as" should be replaced by "as it happens in other areas" Done

-Page 2, line 40: "The North Iran. . ." should be replaced by "The Northern Iran.." Done

-Page 2, line 42: If all the species you cite do not fit in ALL categories (i.e. protected, endangered and endemic animals), you should replace "and" by "or". Done

-Page 4, line 70: "The simulator is a semi-empirical..." should be replaced by "The simulator, which is a semi-empirical...". Done

-Page 4, lines 77-80: The second part of the sentence beginning with "However, the

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use...” (i.e. “...and corresponds to the primary step to then apply the simulator at larger scales”) does not fit with the first part. The whole sentence should be rewritten or this second part separated in another sentence. Done

-Page 5, line 89: “The outputs. . .” instead of “. . .: the outputs. . .” We corrected the sentence.

-Page 5, line 91: “during recent years” instead of “during the recent years, ...” Done

-Page 5, line 92: “. . .fuel maps still result difficult to be generated and updated...” This part of the sentence is not correctly written. A possible text would be : “, it is still very difficult to generate and update reliable fuel model maps in many regions. . .” Done

-Page 5, line 93: “..fuel model cartography” instead of “..geospatial fuel model cartography”. As you say “cartography”, “geospatial” is redundant. Done

-Page 5, line 93: “suitable” instead of “employable” Done

-Page 5, line 101: “. . .replicating historical wildfire spread..” instead of “. . .replicating wildfire spread..” Done

-Page 7, line 138: The “park” instead of “Park”. Done

-Page 8, line 168: “Specific” instead of “Species”. In the sentence we mentioned the vegetation species; so we could not use “specific”.

-Page 10, line 215: “based on..” instead of “by..” Done

-Page 11, line 225: “the” instead of “to” We rephrased the sentence.

-Page 11, lines 233-234: “vegetation structural characteristics” instead of “vegetations structure characteristics” Done

-Page 13, line 272: The citation of Table 5 is not appropriate here. Done

-Page 14, line 288: ”spatial accuracy” instead of “accuracy“ Done

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-Page 14, line 288: “simulated fire spread” instead of “fire spread“ Done

-Page 14, line 304: ”spatial agreement” instead of “agreement“ Done

-Page 17, line 366: ”The shrublands showed a rate. . .” instead of “; the shrublands showed rate. . .“ Done

-Page 17, line 370: ”This explains. . .” instead of “; this explains. . .”. Besides, this sentence is not correctly written. Done

-Page 17, line 372: ”As well as for the rate of. . .” instead of “As well as rate of . . .“. Done

-Page 17, line 372: “ . . . .intensity were identified between grasslands. . .” instead of “intensity between grasslands . . .” . . .“. Done

-Page 17, line 373: “. . . .other vegetation types.” instead of “vegetations were identified”. Done

-Page 18, line 383: “. . . the expected behavior of hypothetical fires. . .” instead of “the expected fire behavior and... “ Done

-Page 18, lines 383-384: “. . .and play a key role in proactive decision-making to take decisions before the fire front arrival” . This second part of the sentence is not well written and should be improved. We corrected the sentence.

-Page 18, line 385: “adoption and application in a given landscape should. . . ” instead of “adoption and application should. . .”. Done

-Page 18, lines 392-394: “These sources may include an insufficient accuracy of. . .” instead of “These include the accuracy of. . .” Done

-Page 18, lines 392-393: “. . .bias in weather station locations compared to where the fire is burning...”. This part of the sentence is not correct. Rewrite. The sentence was corrected.

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-Page 18, line 393: “mapping of fire perimeters” instead of “mapping of fire perimeter locations“ Done

-Page 18, line 394:”. . . errors from the user who runs the models”. This is not precise enough. We completed the sentence.

-Page 19, line 403: “replicate real fire perimeters” instead of “replicate fire perimeters” We corrected the sentence.

-Page 19, line 410: ”spatial agreement” instead of “agreement“ Done.

-Page 20, line 424: I think you mean ”and in agreement with. . .” instead of “and according to..“. Revise and correct if necessary. Done

-Page 20, line 428: “Such. . .” instead of “: such. . .”. Done

-Page 21, lines 445-446: “This work represents a first step in the promotion of fire modeling. . ..“ instead of “This work could represents a first step for the applications of fire spread modeling...“ Done

-Page 21, line 448: “. . .due to the limited availability of data about local fuels and fires..” instead of “. . ..the local fuels and fire data available. . ..”. Done

-Page 21, lines 446-449: “Quantifying ....is needed.” The whole sentence sounds weird. You should rewrite it. Done

-Page 21, line 450: Do you mean in “. . .other study areas” rather than “the study areas”? Corrected

-Page 21, lines 452-454: The sentence is not very correct and should be rewritten. Done

-Page 21, line 454: You could add “more precise” before “ photo-guides. . .”. Done

Tables: As previously commented, a new Table should be added showing the reclassification of vegetation types into standard fuel models that you have proposed. This

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information was provided in Table 3.

Table 1: It is incomplete. We need to know which are the vegetation structural variables that were sampled and the quantitative values obtained. We added the vegetation information in the fuel mapping section

Figures: Figure 3: Do you mean “Monthly mean fire number and burned area”? We corrected the caption of the table.

Figure 4: It would be interesting to also know the evolution of this relationship across the studied period. We added the information for the studied period (2000-2011).

Figure 5: You have to comment when were those vegetation maps produced in each site. The colours that have been chosen for representing some of the different vegetation types are too similar and make the maps difficult to interpret. We corrected the vegetation map.

Figure 6: The various standard fuel models that you have proposed for each fuel type have to be indicated. Done

Figure 7: “grey” instead of “gray”. It seems that only one FARSITE simulation was performed for each experimental case. Is it right? Do you consider that it is reliable enough? Justify. As commented previously, this is never explained in the Methods. Figure 7 shows the fire spread perimeters (30 minute interval) of the best FARSITE simulations (grey) vs. the observed fire perimeters for each case study. As written in the text and presented in Table 4, we ran several simulations for each case study. So the Reviewer’s comment is not right.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/2/C2903/2015/nhessd-2-C2903-2015-supplement.pdf

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 6201, 2014.

NHESSD

2, C2903–C2922, 2015

Interactive Comment

Answers to Reviewers

EDITOR

COMMENTS FOR THE AUTHOR:

Editor´s comments:

Reviewer #1:

General comments

The article is not innovative because it consists in the calibration of a well-known fire behavior model (FARSITE) to a set of 4 fires in Iran. For this reason I think it should not be accepted in NHESS. In addition, this is an article: (i) very extensive that needs to be reduced by removing a large part and unnecessary repetition of text information displayed in tables and figures; (ii) repetition of the same information in different parts that also need to be removed; (iii) confused and needing to be rearranged because of the dispersion of information across different sections. There are a lot to explain and too many corrections to make. Most of the discussion section is composed by general aspects (e.g. lines 380 – 394), a repeated presentation of results (e.g., lines 410 - 422) but misses the true discussion/interpretation/validation of the obtained results. At this stage, the manuscript cannot be accepted for publication and should only be reconsidered after a major revision.

Thank you for the comments. We improved the manuscript taking into account the points highlighted.

Specific comments

1. Lines 40 – 50, It does not seem to follow the nhess rules for the citations
We corrected the citations.

2. According to the nhess "Informal or so-called "grey" literature may only be referred to if there is no alternative from the formal literature." With this in mind please remove citations on lines 150, 162, 783, 788 and 798;
We removed the informal literature.

3. Line 102, please replace "We tested different standard fuel models" by "We tested two sets of different standard fuel models";
Done

4. Lines 104 – 105, I believe that the authors did not analyzed this aspect;
We do not agree with this comment. For instance, Table 5 reports rate of spread, fireline intensity and flame length for each standard fuel model, for the best simulation, and for each case study.

5. Please avoid relative or imprecise concepts. For example, in line 111, please replace "This study was carried out considering a set of fires" by "This study was carried out considering a set of four fires"; what is a "not too strong" wind (line 361)? What are "relatively moderate values" (line 423)?
Done.
We also specified the wind speed conditions and better explained the sentences.

6. Line 116, please provide a definition of "xeric weather conditions" or substitute that concept by a more known concept by the general reader;
We replaced the term "weather" with "climate". We do think that the concept of xeric does not need further explanations.

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Fig. 1.

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Interactive Discussion

Discussion Paper