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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Forest fire risk assessment in Sweden using climate model data: bias correction and future changes" *by* W. Yang et al.

Anonymous Referee #1

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GENERAL COMMENTS

This study illustrates the use of two climate projections driven by different forcing for forest fire risk studies and for determining future climate impacts on forest fires in Sweden. The authors showed that the raw climate model (GCM or GCM/RCM) outputs do not match very well the key weather variables in fire risk modelling, determining large inaccuracies in fire risk predictions. This is due to a range of factors, including uncertainties in observations, inaccuracies in physical process description, coarse resolution of climate models, etc. A distribution-based scaling (DBS) approach was developed as a post-processing tool with the purpose of correcting systematic biases in climate mod-

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elling outputs. The effects of the post-processing tool on precipitation, temperature, relative humidity and wind speed were analyzed. The Canadian Fire Weather Index system was then used to evaluate the influence of changing meteorological conditions on the moisture content in fuel layers and the fire-spread risk. Using DBS produces more realistic estimates of forest fire risk than using raw climate outputs. Based on these results, the approach proposed by the authors indicates that in the future southern Sweden is likely to have a higher fire risk than today, whereas northern Sweden will have a lower risk of forest fire.

The Results section includes 4 Tables and 12 Figures. Here is a summary of the main results reported in the paper: - Seasonal variations and probability functions of weather data (FWI inputs) during the calibration period (1966-1985) at Edsbyn station using observed data and raw output of the climate models. - Seasonal variations and probability functions of weather data (FWI inputs) during the validation period (1986-2005) at Edsbyn station using observed data and the “corrected” output of the climate models. - Seasonal variations of FWI indices and frequency of fire danger classes at Edsbyn station obtained using observed data, raw and corrected output of the climate models for both calibration and validation periods. - Annual mean of days with high fire risk estimated using observed data and raw and corrected output of the climate models during the calibration period for 14 stations. - Percentage changes of number of days with high fire risk during three future periods (2011-2040, 2041-2070, and 2071-2100) compared to the period 1966-1995 for 14 stations.

Based on the fact that wildland fire risk is largely influenced by weather conditions, more than half of the article is dedicated, throughout the MS, to discuss and analyze biases in climate models and methods that can be used to correct systematic biases in climate modelling outputs. I found a kind of mismatch between the title (Forest fire risk assessment in Sweden using climate model data: bias correction and future changes) and the content of the article. The title indicates that the focus is on fire risk assessment. The content of the MS focuses much more on climate model data and

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bias correction on climate model data rather than fire risk. In other words, the approach proposed to correct the bias of climate model is interesting and valid and can be used for any type of impact due to climate change, including obviously the potential impacts on wildland fire regime. However, I find that the context of the research in general is appropriate for NHESS. Although the study seems well conducted, I suggest to reduce the number of figures and to revise the title so that it accurately reflects the content of the paper. For these reasons, I think that the MS needs very minor revision before publication in NHESS.

SPECIFIC COMMENTS

- Page 844, lines 3-8. I suggest to espress measurement units in mm and mm per day rather than inches. Consequently, eq 9 should be corrected (substitute 400 for 100) a well as the moisture equivakent Q and the portential evapotranspiration V units (substitute mm and mm per day for inch and inch per day).

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 837, 2015.