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Interactive comment on “Effects of lightning and other meteorological factors on fire activity in the North American boreal forest: implications for fire weather forecasting” by D. Peterson et al.

Anonymous Referee #1

Received and published: 7 May 2010

Review of

Effects of lightning and other meteorological factors on fire activity in the North American boreal forest: implications for fire weather forecasting.

D. Peteron, J. Wang, C. Ichoku, and L. Remer

Recommendation: Accept with minor revisions

General Comments

The authors have presented a manuscript investigating the role of lightning and meteorological factors on fire in Western Canada and Alaska. The authors use lightning

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data from the Canadian Lightning Detection Network (CLDN) and Alaska Lightning Detection Network (ALDN); weather data from the North American Regional Reanalysis (NARR); and fire data from satellite-detected (MODIS) hotspots. The data period ranges from 2000 to 2006 (seven years), focusing on the principal burning months: June, July and August.

I found the paper to be well-written with no apparent grammatical errors. The methodology seemed logical and the figures and tables well presented. The authors could have referenced various lightning-caused fire models in Canada (Anderson 2002, Kourtz and Todd 1991, Wotton and Martell 2005)

I was concerned over the extent of the study regions A and B. The paper focuses on the fire in the boreal forest but these windows cover large areas extending from the Canadian Prairies to the Arctic tundra, with the boreal forest covering 10-20% of each window. The smaller windows captured by windows 1 through 6 are more representative of the boreal forest.

Continuing on this theme, I question the value and practicality of section 4, the large-scale analysis. As I understand it, the authors are correlating annual average values of meteorological and lightning data within these large study regions A and B (which I commented on earlier). In other words the authors are regressing the annual average temperature, humidity, etc (seven data points per regression) over an immense region against fire activity in the boreal forest, which covers only 10-20% of the region. In the end, meteorological factors that are normally correlated with fire activity are seen as relatively insignificant ($R < 0.5$). It is good to see some strong correlations, though.

Bottom line: I think the paper stands on its own without this section and I encourage the authors to simply drop it.

Specific Comments

[Page 8302, line 13] "The low human population in this portion of the boreal forest..." is

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a sweeping statement. Remember that perhaps a third of the Canadian population (10 million people) resides in region B.

[8302, 16] “anthropogenic influence is minimal...” is another sweeping statement. Within region B, approximately half the fires south of 60° are caused by people (see http://nfdp.ccfm.org/fires/national_e.php).

[8310, 12] “In contrast, there is an unconformity in central Canada...” The authors may refer to Anderson et al 2007, which describes and then models two large fires within this region.

[8314, 21] “When using MODIS, this time should be reduced, ...” The authors should bear in mind that these smoldering fires may be less detectable by MODIS due to their small size. Intuition tells me that MODIS would be poorer at detecting lightning-caused fires hotspots except in the observation zones where detection flights are infrequent.

[8318, 9] “The lower levels are likely a result of...” In northern latitudes the positive charge center of thunderstorms is closer to the surface. This results in a higher proportion of positive lightning flashes. As positive flashes have stronger and longer currents, it is generally accepted that they are more prone to triggering fires. Actually, I’m a little surprised that any discussion on lightning polarity is missing from this manuscript. I refer the authors to several papers on the subject (Latham and Schlieter 1989, Shindo and Uman 1989, Uman 1987)

[8318, 25] “However, high Pwxy values also exist with much lower instability and heights.” A factor that these results may indicate is virga. The high, dry lightning may be dry because the rain evaporates before it reaches the ground while lower altitude storms at similar CAPE will result in wet storms as the rain reaches the ground. Also this entire discussion has overtones of the Haines Index.

References

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