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Interactive comment on "Spatiotemporal patterns of tundra fires: late-Quaternary charcoal records from Alaska" *by* M. L. Chipman et al.

Anonymous Referee #2

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This paper uses lake cores from two different arctic lakes to examine the prevalence of tundra fires in the Holocene and beyond by analyzing charcoal abundance from the lake sediments. This kind of a paleo study was necessary to determine fire return intervals for the arctic tundra after the large Anaktuvuk River Fire that many called unprecedented. I think this paper does a nice job in showing how rare tundra fires are in Alaska during the Holocene. Some things that would be useful to expand upon are how far does charcoal from a tundra fire reach? In other words, there's not a lot of biomass to combust (compared to a boreal fire), so how much charcoal is produced in a tundra fire (or is there a scale of severity of burn, type of tundra, distance from lake that can be used?) I think you allude to the use of the Higuera et al., 2010 model, but do you use it here? Or are you just basing your analysis on the findings of Higuera et al.? Either way, add another sentence or two on the basis of the model. I had to go

read that paper to answer a lot of the questions I had about the methodology here and to see if it included arctic sites.

Figure 1. Perhaps it would be helpful to have a circle outlining the 100km radius around each lake that would encompass the presumed area charcoal records.

P3187, line 15: While there's only one statistically significant fire at Upper Capsule Lake, there's much higher background char, especially compared to Perch, which is relatively close. . . what's the reason for that?

P. 3188, line 5-8: Is Keche Lake on the south slope of the Brooks Range? I would be careful in stating that it was drier than normal during that time period. I think that may be the case farther south in the interior (where the heavily cited Abbott et al., 2000 Birch Lake is located), but there's a lot of heterogeneity in both temperature and precipitation in Alaska throughout the Holocene. Mann et al., 2002; Mann et al., 2010 calls the early Holocene on the N. Slope wetter than today, which could explain the lower fire. There's also plenty of evidence of peatland expansion during the early Holocene, including in arctic Alaska (Mann et al., 2002; Jones and Yu, 2010), suggesting that it's moister, as peatlands can't expand or initiate in a dry climate. No fire 11.4-8.8 ka supports the idea of a moister climate in that location at that time. Jones and Yu 2010 show an abrupt decline in new peatland initiation in Alaska around 9ka, which also coincides with your increase in fire, so potentially a change in vegetation but also drier.

P. 3188, line 18-19: again, using Abbott et al., 2000 to say that early Holocene Alaska was drier than the middle Holocene. I think moisture didn't penetrate as far as the interior during the early Holocene but the N. Slope and south-central were wetter.

P. 3188-3189, lines 12-15: Can you give a time frame of when white spruce stands emerged near this site?

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/12/C2415/2015/bgd-12-C2415-2015-

supplement.pdf

Interactive comment on Biogeosciences Discuss., 12, 3177, 2015.