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Fire regime impacts on post-fire diurnal land surface temperature change over North American boreal forest

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Wildfire is the most prevalent natural disturbance in the North American boreal (BNA) forest and can cause post-fire land surface temperature change (ΔLST_{fire}) through biophysical processes. Fire regimes, such as fire severity, fire intensity and percentage of burned area (PBA), might affect ΔLST_{fire} through their impacts on post-fire vegetation damage. However, the difference of the influence of different fire regimes on the ΔLST_{fire} has not been quantified in previous studies, despite ongoing and projected changes in fire regimes in BNA in association with climate change. Here we employed satellite observations and a space-and-time approach to investigate diurnal ΔLST_{fire} one year after fire across BNA. We further examined potential impacts of three fire regimes (i.e., fire intensity, fire severity and PBA) and latitude on ΔLST_{fire} by simple linear regression analysis and multiple linear regression analysis in a stepwise manner. Our results demonstrated pronounced asymmetry in diurnal ΔLST_{fire}, characterized by daytime warming in contrast to nighttime cooling over most BNA. Such diurnal ΔLST_{fire} also exhibits a clear latitudinal pattern, with stronger daytime warming and nighttime cooling one year after fire in lower latitudes, whereas in high latitudes fire effects are almost neutral. Among the fire regimes, fire severity accounted for the most (43.65%) of the variation of daytime ΔLST_{fire}, followed by PBA (11.6%) and fire intensity (8.5%). The latitude is an important factor affecting the influence of fire regimes on daytime ΔLST_{fire}. The sensitivity of fire intensity and PBA impact on daytime ΔLST_{fire} decreases with latitude. But only fire severity had a significant effect on nighttime ΔLST_{fire} among three fire regimes. Our results highlight important fire regime impacts on daytime ΔLST_{fire}, which might play a critical role in catalyzing future boreal climate change through positive feedbacks between fire regime and post-fire surface warming.