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Radiative forcing through changes in climate and in forest cover in Canada's forests

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Canada's territory holds 10% of the world's forest, mostly in high-latitude areas with a dominance of conifers and with snowy winters. Changes in disturbance regimes and in climate may change both the extent and duration of the snow cover as well as the type and properties of the forest cover, thereby providing either negative or positive feedback to climate change. We use empirical data on forest properties from Canada's National Forest Inventory and MODIS-based estimates of surface albedo to explore potential radiative forcing consequences of such changes. Mean annual reflected radiation across these forests is estimated to be of 1.8 W m-2, with a pixel-level range from 0.4 to 4.4 W m-2. About 50% of this variability is explained by the duration of the snow cover, while the amount of biomass and the percent of evergreen conifer within this biomass explain 17% and 10% respectively of the observed variance. A simple empirical model is used to develop a predictive relationship through which consequences of changes in snow cover duration, decrease in biomass and changes in the proportion of evergreen conifers are explored.