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IN SITU AND SATELLITE OBSERVATIONS FOR ACCURATE DETECTION OF PLANT PHENOLOGY AND EXTENT OF SNOW COVER IN BOREAL FORESTS

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Accurate detection of the spatio-temporal variability of plant phenology (e.g. timing of leaf-expansion, -colouring, and -fall) and extent of snow cover is important but challenging task to evaluate the ecosystem functioning and service in boreal forests under rapid meteorological and climate changes. Towards this aim, satellite remote-sensing observation is very useful. However, it has not sufficiently tested and validated by the ground-truthing in boreal forests. To resolve this problem, we have conducted phenological and snow observations in Siberia and Alaska by using time-lapse digital cameras and then examined the relationship between satellite-observed vegetation indices and time-lapse digital images. We found that (1) green-red vegetation index (GRVI)=0.0, which consists of visible red and green reflectance bands, showed the peak timing of leaf-colouring in a closed-canopy deciduous coniferous (larch) forest in Siberia and that of leaf-expansion and -colouring, which was mainly derived from phenology of forest floor vegetation, in an open-canopy evergreen coniferous (black spruce) forest in Alaska and (2) normalized difference vegetation index (NDVI) and normalized difference water index (NDWI), which consist of visible red and near-infrared bands, detected significant variations at the end and beginning periods of continuous snow cover.