衛星リモートセンシングによるアラスカの陸域生態系のフェノロジー観測に関する地上検証
Ground-truthing for phenological observations by using satellite remote sensing in terrestrial ecosystem in Alaska

永井 信1*, 中井 太郎 2, 小林 秀樹 1, 金木 力英 1, 金龍 元 2
Shin Nagai1*, Taro Nakai2, Hideki Kobayashi1, Rikie Suzuki1, Yongwon Kim2

1 海洋研究開発機構地球環境変動領域. 2 アラスカ大学フェアバンクス校国際北極圏研究センター

Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology, 2 International Arctic Research Center, University of Alaska Fairbanks

Satellite remote-sensing is an useful tool to detect seasonal and interannual variations in sub- and Arctic terrestrial ecosystems with a high spatio-temporal resolution. However, from the in situ ecological research view point, the satellite remote-sensing approach has not been sufficiently tested and validated by ground-truthing. We examined the relationships between seasonal patterns of camera-based canopy surface indices, eddy-covariance-based gross primarily productivity (GPP) and satellite-observed vegetation indices at a daily time step by performing field studies in an open canopy black spruce (Picea mariana) forest in Alaska. The ratio of the green digital number to the total digital number, green-excess index, hue (in the hue, saturation, and intensity colour model), GPP, satellite-observed normalized difference vegetation index (NDVI), enhanced vegetation index (EVI) and green-red vegetation index (GRVI) showed bell-shaped seasonal patterns (increasing in spring and decreasing in autumn) and their correlations were detected. Although the upper layer of forest is fully covered by evergreen black spruce, canopy surface images mainly detected seasonal changes in forest-floor vegetation (Sphagnum moss and shrubs) and snow cover on the forest floor. These facts suggest the importance of the seasonal patterns of forest canopy and floor status for the observations of satellite-remote sensing in sparse boreal forest in Alaska. Further consideration of parameters such as the degree of canopy openness and the seasonal changes in forest-floor vegetation will therefore be required to accurately detect the intra- and interannual phenological changes in sub- and Arctic ecosystems by using the satellite remote-sensing approach.

キーワード: 衛星リモートセンシング観測, 地上検証, 植生フェノロジー, アラスカ
Keywords: satellite remote sensing, ground-truthing, phenology, Alaska