POSTER 24

기후인자와 식생유형이 알라스카 총 1차 생산성의 연간변화에 미치는 상대적인 기여

이제인[1,5], 류영렬[1,2,3,4]*, Chongya Jiang[4], 박상종[5], 이방용[5], 이유경[5]
[1]서울대학교 협동과정 농림기상학전공, [2]서울대학교 조경·지역시스템공학부,
[3]서울대학교 협동과정 조경학 전공, [4]서울대학교 농업생명과학연구원, [5]극지연구소

Relative Contribution of different Climate drivers and Plant Functional Types to Growing Season Gross Primary Productivity Interannual variation in Alaska

Jane Lee[1,5], Youngyrel Ryu[1,2,3,4*], Chongya Jiang[4], Sangjong Park[5],
Bang Yong Lee[5] and Yoo-Kyung Lee[6]
[1]*Interdisciplinary program in Agriculture and Forest Meteorology, Seoul National University, Republic of Korea,*
[2]*Department of Landscape Architecture and Rural Systems Engineering, Seoul National University, Seoul, Republic of Korea,*
[3]*Interdisciplinary Program in Landscape Architecture, Seoul National University, Republic of Korea,*
[4]*Research Institute of Agriculture and Life Sciences, Seoul National University, Republic of Korea,*
[5]*Korea Polar Research Institute, Republic of Korea*

Substantial warming in the high latitudes, which is characterized by low temperature and short growing seasons, affects land-atmosphere interactions of carbon dioxide. Therefore, it is important to understand how the spatiotemporal pattern of gross primary productivity (GPP), the largest carbon flux that drives important ecosystem processes such as respiration and vegetation growth, responds to climate variables resulting in interannual variability (IAV). The objective of this study is to quantify the relative contribution of different plant functional types (PFT) to GPP interannual variation in the growing season from four satellite based approaches to climate variables in Alaska from a period of 2001 to 2011 at a regional scale. Previous studies show that IAV of GPP in the high latitudes is dominantly driven by air temperature and radiation depending on region and plant functional types (PFTs), but the relative contribution of different PFTs to GPP IAV has not been studied in the literature so far. It is important to understand the differences from the contribution of PFTs to GPP IAV in a warming climate may be caused by different functioning of vegetation or differences in the local environment. To investigate the relative contribution of PFTs to GPP IAV, 1) we use 17 eddy covariance data to evaluate GPP estimated from BESS, MODIS, SVR and FLUXCOM across different plant function types. 2) We investigate the changes in the growing season IAV of GPP with different climate variables according to PFTs. 3) We explore the relationship between IAV of GPP and climate variables across Alaska, quantifying their relative contribution. This study will focus

* Correspondence to : ryuyr77@gmail.com

on Alaska, excluding the Panhandle of Alaska, from 2001 to 2011. Growing season interannual variation is the deviation of growing season mean from the 11 year growing season mean. Growing season GPP IAV was further portioned into four different PFT: tundra, evergreen needleleaf forest (ENF), deciduous broadleaf forest (DBF) and fire scar. Evaluation of BESS, MODIS, SVR and FLUXCOM show that they capture at least 70% of the of monthly variability with RMSE of 1.12 gC m^{-2} yr^{-1}, 1.01 gC m^{-2} yr^{-1}, 1.07 gC m^{-2} yr^{-1} and 0.69 gC m^{-2} yr^{-1}, respectively, and bias of 0.41, 0.17, -0.27, -0.07, respectively, for each model. Partitioning GPP IAV according to PFTs show that tundra accounted for the largest fraction of about 60%, followed by ENF, DBF and Fire Scar regions. Air temperature was the dominant driver of GPP IAV in all PFTs, however, it also interacted with precipitation and radiation in GPP IAV in the growing season in Alaska. Our findings show tundra contributes most to the interannual variation of GPP, which is mainly driven by air temperature. Therefore, warming and cooling as a result of climate change will significantly impact the interannual variation of land-atmosphere interaction of CO_2, especially in tundra.