POSTER 01

Current status of greenhouse gas balance in the Arctic black spruce forest based on the long-term observation and the future progress

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We set up the GHG flux observation tower on the black spruce forest in interior Alaska (64.8N, 147.9W) to reveal the impacts of environmental change on GHG balance. In this paper, we focus on a sustainability in GHG balance of the Arctic ecosystem under current environmental changes.The annual NEE of black spruce forest has positive correlation with the ecosystem respiration, RE. Cumulative NEE over 15 years was almost neutral, but showed a fifteen year cycle with positive (source) period of 2009, 10, 11, 14 and negative periods. Low precipitation and high temperature years provided lower GPP than RE, resulted in positive annual NEE. While, high precipitation and low temperature resulted in negative NEE.

Factors affecting interannual variability of GPP, RE, and NEE were examined.
GPP during midsummer and autumn was correlated with the yearly variations of air temperature Tair, short wave radiation Rsd, and water vapor deficit, VPD. Yearly variations of Tair and VPD were also correlated with RE. Shallow underground water level (WL) and deep thawed soil depth enhanced negative NEE during late growing period. Yearly variations of WL and rainfall (RF) negatively correlated with RE, suggesting the wetter ground conditions suppressed heterotrophic respiration of the forest. Machine learning is planned to apply to the current data to clarify the correlations. Longer time span and wide range data set is strongly needed for further studies.

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