Snow damage strongly reduces the strength of the carbon sink in a primary subtropical evergreen broadleaved forest

Qing-Hai Song\textsuperscript{1,2}, Xue-Hai Fei\textsuperscript{1,2,4}, Yi-Ping Zhang\textsuperscript{1,2,3*}, Li-Qing Sha\textsuperscript{1,2}, Chuan-Sheng Wu\textsuperscript{1,2,4}, Zhi-Yun Lu\textsuperscript{1,3}, Kang Luo\textsuperscript{1,3,4}, Wen-Jun Zhou\textsuperscript{1,2}, Yun-Tong Liu\textsuperscript{1,2}, Jin-Bo Gao\textsuperscript{1,2,4}

\textsuperscript{1} Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, China
\textsuperscript{2} Global Change Ecology Group, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, China
\textsuperscript{3} National Forest Ecosystem Research Station at Ailao Mountains, Jingdong, Yunnan, China
\textsuperscript{4} University of Chinese Academy of Sciences, Beijing, China
E-mail: sqh@xtbg.ac.cn

A primary subtropical evergreen broadleaved forest in Southwest China experienced a particularly extreme snow event during January 2015. We analyzed five years of continuous measurements of CO\textsubscript{2} exchange across the biosphere/atmosphere interface in the forest using an eddy covariance technique. We quantified how exposure to an anomalously heavy snow affected ecosystem processes that determine gross primary productivity (GPP) and ecosystem respiration (R\textsubscript{eco}), and thus annual net C sequestration. The forest canopy was damaged strongly by the heavy snow and the leaf area index (LAI) decreased significantly from January to July 2015. GPP, net ecosystem exchange (NEE), and R\textsubscript{eco} all sharply decreased in 2015 after the heavy snow. On average, a strong decrease of 544 g C m\textsuperscript{-2} year\textsuperscript{-1} in annual NEE in 2015 was associated with a decrease of 829 g C m\textsuperscript{-2} year\textsuperscript{-1} in annual GPP and a decrease of 285 g C m\textsuperscript{-2} year\textsuperscript{-1} in annual R\textsubscript{eco}. Therefore, GPP in 2015 decreased by 41 % and R\textsubscript{eco} decreased by 22 %. Overall, annual net carbon uptake in 2015 was reduced by 76 %. The 2015 event enabled the quantification of the impact of specific climate anomalies on the carbon balance.

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