

帽儿山地区落叶松人工林CO<sub>2</sub>通量特征及对林分碳收支的影响邱岭, 祖元刚, 王文杰<sup>\*\*</sup>, 孙伟, 苏冬雪, 郑广宇

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CO<sub>2</sub> flux characteristics and their influence on the carbon budget of a larch plantation in Maoershan region of Northeast China

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## 摘要

2008年,采用涡度协方差法测定了黑龙江省尚志市帽儿山地区落叶松人工林的CO<sub>2</sub>通量,并于生长季(5—10月)不同月份测定了落叶松叶片光合日变化.结果表明:不同时间段环境因子变化对落叶松人工林净生态系统交换量的影响存在差异,下午(12:00—24:00)的净生态系统交换量对其饱和和蒸汽压亏缺的变化反应较上午(0:00—12:00)迟钝;上午光能利用效率为0.6284 mol·mol<sup>-1</sup>,是下午的1.14倍;随温度上升,上午净生态系统交换量的增幅是下午的1.5倍(气温>15℃).这种差异使落叶松林净碳交换量的88%在上午完成,而下午仅完成净碳交换量的12%;上、下午生态系统生产力分别占全天的60%和40%,上午叶片的光合能力为下午的3倍.落叶松人工林全年净生态系统交换量在263~264 g C·m<sup>-2</sup>,生态系统呼吸在718~725 g C·m<sup>-2</sup>,总初级生产力在981~989 g C·m<sup>-2</sup>.

关键词: 兴安落叶松 涡度协方差法 碳收支 叶片光合作用

Abstract:

From January to December 2008, the CO<sub>2</sub> flux in a larch plantation (*Larix gmelinii*) in Maoershan region of Shangzhi County, Heilongjiang Province was measured by eddy covariance method, and the diurnal changes of leaf photosynthetic rate were measured in growth season (from May to October). There existed differences in the net ecosystem exchange (NEE) of the plantation in different time periods under the effects of environmental factors. In the afternoon (12:00-24:00), the NEE changed more slowly with the variation of vapor pressure deficit (VPD) than in the morning (0:00-12:00); and in the morning, the light use efficiency was 0.6284 mol·mol<sup>-1</sup>, 14% more than that in afternoon. The NEE increased with increasing temperature, and the increment in the morning was 50% higher than that in the afternoon (air temperature >15℃). These differences in responding to environmental changes led to 88% NEE implemented in the morning, and only 12% NEE implemented in the afternoon. The annual gross ecosystem productivity (GEP) in the morning took a percentage of 60%, and that in afternoon took 40%. These findings were supported by the observation at leaf level, *i.e.*, on average of whole growth season, the leaf photosynthetic capacity in the morning was over 2-fold higher than that in afternoon. Generally, the annual NEE, ecosystem respiration ( $R_e$ ), and GEP of the plantation in 2008 were 263-264 g C·m<sup>-2</sup>, 718-725 g C·m<sup>-2</sup>, and 981-989 g C·m<sup>-2</sup>, respectively.

Key words: *Larix gmelinii* eddy covariance method carbon budget leaf photosynthesis

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