

## Growing season ecosystem carbon budget at larch and disturbed forests in Eastern Siberia and its inter-annual variation

# Takashi Machimura[1]; Go Iwahana[2]; Takashi Hirano[3]

[1] Energy and Environment, Osaka Univ.; [2] Hokkaido Univ.; [3] Agri., Hokkaido Univ

The effect of forest disturbance such as fire and deforestation on ecosystem carbon budget is important and should be investigated in the comprehensive studies of regional and global carbon balance. Net ecosystem carbon dioxide exchange (NEE) at a larch forest, a cutover, an eleven-year old burnt forest and a newly burnt forest near Yakutsk, Eastern Siberia was observed during growing seasons by means of the eddy covariance method in the period between 2000 and 2006. The larch stand was of mature *Larix gmelinii*, its mean tree height and stem density were 8.6 m and 2100 ha<sup>-1</sup>, respectively, and the floor was mainly covered with shrub of *Vaccinium* species, moss and lichen. The cutover was adjacent to the larch stand and experimentally clear cut in 2000. The two burnt forest was once a larch stand and burnt in 1989 and 2001, respectively. Gross primary productivity (GPP) and ecosystem respiration (RE) were evaluated in terms of their dependency on solar radiation and air temperature using the quality conditioned NEE data. Soil respiration was measured at the larch stand and cutover from 2003 to 2006.

Mean seasonal GPP, RE and NEE at the larch forest in seven years were 715, 530 and 185 gC m<sup>-2</sup> (5-month)<sup>-1</sup>, respectively. GPP, RE and NEE of the larch forest showed a large inter-annual variation consequent to changes in LAI, water availability and growing season length. Seasonal NEE at the cutover was 398 gC m<sup>-2</sup> (5-month)<sup>-1</sup>, and GPP and RE of the cutover was about 30% and 110% of those at the larch forest, respectively, in the first year after clear cut, which caused a large carbon dioxide emission from soil. GPP at the cutover increased gradually up to 80% of that at the larch forest along with the recovery course of surface vegetation, however RE kept a high rate (about 140% of that at the larch forest), and NEE showed positive even in six years after the clear cut. The high RE and decreasing soil respiration at the cutover suggested that autotrophic respiration relatively increased whereas heterotrophic respiration decreased along the vegetation succession after deforestation. In contrast, the newly burnt forest, which was quickly covered with dense pioneer plant communities (mainly of *Chamaenerion angustifolium*) showed a large GPP and a negative NEE in two years after fire. However the eleven-year old burnt forest was net carbon source and it suggested that vegetation succession courses which are consequent on forest disturbance largely affect the ecosystem carbon budget.