



Effect of local climate on the reduced forest regeneration at the northern climatological tree-line (Finnish Lapland)

A. Vajda and A. Venäläinen

Finnish Meteorological Institute, Helsinki

claudia.vajda@fmi.fi / Fax: +358-9-19294129 / Phone: +358-9-19294677

The development and structure of natural vegetation in the northern ecosystem are primarily controlled by the climate and climate-relayed external disturbances. The climate-vegetation interactions are particularly important at high latitudes -near the climatological border of occurrence of many plants- as the changes in vegetation and surface conditions may have negative feedbacks on climate that may in turn prevent the vegetation from returning to its original state. Fire is one of the dominant forms of disturbances in the boreal forest and in transition zone between forest and tundra. In the present study we intend to provide new information about the feedback mechanisms between the atmosphere and the surface in the sensitive region of climatological tree-line in Finnish Lapland (Tuntsa area). In 1960 in Tuntsa area, due to a widespread forest fire, 20.000 ha of vegetation were destroyed, whereof more than 9.300 ha spruce forest. Following the fire the reforestation has not succeeded well, a substantial area is still unforested and it is probable that after the fire the local climatological conditions became more unfavourable.

Based on the field measurements data from the recovered forest vegetation and treeless tundra vegetation, as well as, on model simulations made using the CoupModel (Coupled heat and mass transfer model for soil-plant-atmosphere system) we estimated the annual and seasonal dynamics of the post-fire heat and water fluxes in the soil, snow conditions, evaporation and radiation processes. Removal of the primary forest vegetation from the impacted site caused: more unfavourable climate and soil conditions for vegetation, changes in soil temperature regime, considerable accumulation of water content in topsoil, stronger winds and reduced evaporation and snow

cover. The cold watershed local climate of the impacted area and the changed post-fire environmental factors are probably the main reasons for the reduced vegetation recovery. The high logging intensity of the damaged trees following the fire, the reduced soil quality and the large number of reindeers that are herded in this region may impact the already difficult regeneration conditions.