Geophysical Research Abstracts, Vol. 8, 08296, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08296

Radiation distribution on a clear-cut within a mature forest stand on a gentle slope.

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The development of soil properties and ground vegetation suddenly exposed to the direct atmospheric influence after a clear cut is controlled mainly by the radiative regime and especially by direct solar radiation (Gray et al., 2002). The same is true for the remaining trees surrounding the clear-cut (e.g. Chen et al., 1995). The degree of the influence is affected by the gap size, inclination and exposition of a slope (if any) and by the structure of surrounding forest. However, to quantify the radiation distribution at the gap and the adjacent forest with sufficient accuracy either an continuous long-term measurements under various meteorological conditions or high resolution modelling should be implemented. In present study the both methods were combined: 1) the high resolution 3-D model of radiative transfer (Knyazikhin et al., 1997; Panferov et al., 2005) and continuous short-wave radiation measurements at clear-cut area to support and to validate model calculations. A recent clear-cut of about 22500 m^2 (150m$\times$150m) in Solling mountains, Germany was chosen as an experimental forest site. The site is located on a gentle slope (3.12˚) with northern exposition. The gap is surrounded from 3 sides by mature 120 y.o. spruce stand and bordered by mature oak-beech stand from the fourth. The modelling was performed with a resolution of 1 m for both vertical and horizontal axes on a domain of 300 m$\times$300 m$\times$70 m which included gap and 75 m-wide bands of forest at gap sides. The vegetation period 2005 was modelled with a time step of 15 min. Both direct and diffuse components of short-wave radiation were considered in modelling experiments. The angular distribution of diffuse radiation were described both for overcast and clear-sky conditions. The radiation was measured at 7 meteological stations within the gap and in the adjacent forest. The data were sampled every 10 sec and averaged over 5 min interval. The results show a very good agreement between modelled and measured radiation for typical mete-

orological situations. The analysis of modelling allowed to quantify the predictable influence of slope. However the range of edge influence depending on solar position exceeded the modelling domain and, thus significantly exceeded 60 m, measured by Chen et al., (1995). Also it was possible to characterize the effect of small–scale relief heterogeneities. Besides that it was shown that the structure of surrounding forest – e.g. the crown form, LAD and its seasonal dynamic has a significant influence on radiation variations within the investigated domain, controlling rather the insolation gradients on the gap than the range of edge influence. The distribution of sunflecks on trees stems as a function of sun position was also studied.

This study was supported by the BMBF/DLR (Grant 01LD0005 within the frames of DEKLIM Program) and by DFG (Grant Gr 738/16-1).