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Spatial and Temporal Patterns of CO_2 in Soil-Vegetation-Atmosphere Systems.

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Soil, vegetation and the adjacent atmospheric boundary layer constitute key compartments which lie within the scope of mankind. These compartments are characterized by extremely complex inner patterns, structures and processes that act at different time and space scales but also by a continuous exchange of momentum, energy, water and carbon between compartments. Within the scope of the Transregional Collaborative Research Centre 32 "Patterns in Soil-Vegetation-Atmosphere Systems: monitoring, modelling and data assimilation" this spatio-temporal variability of catchment properties and their effect on water, solute and CO_2 fluxes on a mesoscale is addressed. In this context special emphasis will be placed on the investigation of spatial patterns of soil CO_2 effluxes and the follow-up application of a mesoscale model for simulating carbon related processes. Weekly CO_2 soil respiration measurements using a closed dynamic chamber system will be carried out at two research sites (forest, grassland) in the River Rur basin situated in Western Germany. The data obtained from these measurements along with other data concerning soil moisture, temperature, pH etc. will then be used to analyze the temporal variability of spatial patterns using a physically based 3-d water and transport model. For the simulation of carbon related processes a further development of the model will be required.

In this presentation a focus is laid on a first evaluation of results of CO_2soil-respiration measurements in a micro-scale forest catchment with regard to spatial and temporal patterns. The measurements are carried out at 35 sites in the period from July 2006 to October 2006 and are supplemented by soil moisture and discharge data. With the continuation of these analyses in the near future new findings on the spatial variability of

hydraulic properties and nutrient status will help to improve approaches to efficiently manage natural resources. More sustainable management strategies with respect to regional climate change could be initiated on the basis of new findings on the dynamics of carbon sequestration and emission, e.g. with regard to land cover change. Furthermore the improvement of environmental forecast, e.g. weather, regional climate change, flood prediction, represents one of the targets.