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Forest-atmosphere interactions and forest ecology research at SMEAR stations

This issue is the second of two special issues related to the research activities at SMEAR (Station for Measuring Forest Ecosystem–Atmosphere Relations) stations. The SMEAR I station, located at Värriö, has been operating since 1991 and the SMEAR II station, located at Hyytiälä, since 1995. The first special issue was published last year with a focus on aerosol research. Both issues are based on presentations given in an APFE (Aerosol Physics and Forest Ecology) seminar on 7–9 February 2000. The SMEAR stations are operated by the APFE group. This group consists of ca. 50 scientists and is one of the Centres of Excellence at the University of Helsinki.

Any plant community substantially affects the microclimate within it and, in turn, the microclimate influences the community. This interaction is mediated by atmospheric turbulence. The capability to understand biosphere-atmosphere interactions requires in depth knowledge of underlying physical, meteorological, chemical, ecological and physiological processes. At its best, research should be based on long-term field observations combined with theory, employing analytical methods of a fundamental as well as applied nature.

All these aspects are represented in the seven papers of this issue. The first paper provides valuable background information on biomass distributions for general use. The next two papers are based on soil field studies at SMEAR II carried out by the research group from the Department of Applied Chemistry and Microbiology (University of Helsinki). The fourth and fifth papers deal with evapo-transpiration, the former focusing on a measurement technique of sap flow and the latter linking together evapo-transpiration measurements by eddy covariance techniques and sap flow modelling. The last two papers offer different perspectives on carbon dioxide exchange: paper six presents new values for photosynthetic parameterization, and paper seven provides long term time series on the net ecoystem exchange together with latent and sensible heat fluxes.

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