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Eddy Covariance Measurements of Carbon Dioxide, Latent and Sensible Energy Fluxes above a Meadow on a Mountain Slope

A. Hammerle, A. Haslwanter, M. Schmitt, M. Bahn, A. Cernusca, G. Wohlfahrt

Institute of Botany/Department for Ecology, University of Innsbruck, Sternwartestr. 15, Austria (albin.hammerle@uibk.ac.at / Fax: +43 512-5072715)

Carbon dioxide, latent and sensible energy fluxes were measured by means of the eddy covariance method above a mountain meadow situated on a steep slope in the Stubai Valley/Austria, based on the hypothesis that, due to the low canopy height, measurements can be made in the shallow equilibrium layer where the wind field exhibits characteristics akin to level terrain. In order to test the validity of this hypothesis and to identify effects of complex terrain in the turbulence measurements, data were subjected to a rigorous testing procedure using a series of quality control measures established for surface layer flows. The resulting highquality data set comprised 36 % of the original observations, the substantial reduction being mainly due to a change in surface roughness and associated fetch limitations in the wind sector dominating during nighttime and transition periods. The validity of the highquality data set was further assessed by two independent test: i) the ability of the eddy covariance measurements to close the energy balance and ii) a comparison with the net ecosystem carbon dioxide exchange measured by means of ecosystem chambers. Both tests showed that there was no significant difference in the correspondence with the independently measured variables between the meadow on the slope and another one situated on flat ground at the bottom of the Stubai Valley. We thus conclude that, appropriate quality control provided, the eddy covariance measurements made above a mountain meadow on a steep slope are of similar quality as compared to flat terrain.