EMS Annual Meeting Abstracts
Vol. 7, EMS2010-118, 2010
10th EMS / 8th ECAC


High resolution climatology
- towards climate change services

# Seasonal variations of latent and sensible heat fluxes in complex terrain

O. Liechti (1) and R. Thehos (2)

(1) Analysen & Konzepte, Winterthur, Switzerland (OlivierLiechtiAuK@compuserve.com), (2) Deutscher Wetterdienst, D-Offenbach (Ralf.Thehos@dwd.de)

Flight altitudes of gliders in early spring indicate that the sensible heat flux into the operationally predicted convective boundary layer has to be increased at the expense of the latent heat flux when vegetation is inactive. In late autumn, winter, and early spring transpiration does not contribute to the latent heat flux and allows for increased sensible heat flux in the surface energy budget.

The seasonal variation of the latent heat flux has been parameterized with the climatological daily average temperature: a threshold for the daily average temperature is required for the vegetation to be active. In the complex terrain of the Alps the temperature range from 10 deg C (threshold for active vegetation) down to 2 deg C (threshold for the snow line) for the daily mean temperature covers a significant fraction of the surface. The elevation range corresponding to this temperature range shows a marked seasonal variation. A harmonic seasonal modulation of the daily average temperature was adjusted to climatological station data. Additionally, the vertical decrease of both the annual mean temperature and the seasonal amplitude of the daily mean temperature is relevant in the Alps. Both vertical gradients were again obtained from climatological station data.

The threshold parameterization of the transpiration with the climatological daily mean temperature greatly affects the seasonal variation of the predicted depth of the convective boundary layer, as reduced latent heat flux allows for increased sensible heat flux. The effect on the depth of the predicted convection is most pronounced in elevated complex terrain like the Alps. Glider flight trajectories published daily in online soaring contests are used routinely for the verification of operational convection forecasts. With such GPS based flight data regional predictions of the convective updrafts and of the depth of the convective boundary layer can both be verified with great temporal and spatial resolution, throughout the seasons, and almost in real-time. Such glider flight data have been used to develop and verify the described climatological parameterization of transpiration which significantly affects the seasonal variation of the latent and sensible heat fluxes and thus the depth of convection.