



Roughness length estimation over a complex topography under different wind conditions

Marco Falocchi, Stefano Barontini, and Roberto Ranzi
DICATAM University of Brescia (marco.falocchi@ing.unibs.it)

The choice of a representative value of the roughness length (z_0) is a key aspect to estimate the momentum flux in the lowest atmosphere layer by means of traditional micrometeorological methods. In complex terrains however the orography and the non-uniform land use around the measurement point affect both the winds regime, their turbulent characteristics and therefore the estimate of the representative roughness length as well. Aiming at better characterising this parameter in view of hydrological water-balance applications in complex mountain environments, a micrometeorological station equipped with eddy covariance devices was installed during summer 2012 at Cividate Camuno (Oglio river basin, Central Italian Alps, 274 m a.s.l.). The soil of the experimental site was a lawn covered with 0.6 m–grass for most of the field campaign duration, and with about 0.1 m during the last days.

The wind analyses detected an alternation between two main wind regimes: an Eastern katabatic wind blowing daily since 8 pm until 5 am and a local South–Western wind, called *Óra*, rising the valley from Lake Iseo in the afternoon. Secondary and less frequent drainage conditions were also detected. The aerodynamic drag coefficients (C_D) were calculated from the 30 minutes–averaged turbulent momentum flux and for eight different equally spaced wind direction classes. According to the von Kàrmà̄n logarithmic law for the vertical wind speed profile and to the universal stability functions of the Monin–Obukhov similarity theory, the z_0 was then estimated. The obtained values show a sensitivity to the wind directions, but they seem not to be strongly influenced by the landcover variations.