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Diurnal behavior of the evaporative fraction at local scale observed at Grugliasco, Italy

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Evapotranspiration (ET) rate is one of the most studied parameters used for the understanding of climate related issues. In the past, several models have been developed to estimate ET from the surface energy balance applied at local scale. Much of these methods use meteorological variables like temperature, humidity, wind speed and net radiation. The objective of this paper is to study the latent heat flux which is the principal component of the energy balance. To do so, an analysis of the evaporative fraction (EF) defined as the surface latent heat flux over the available energy is carried out. Meteorological data observed at the experimental site (900 m2) of the Agricultural Faculty of the "Università degli Studi di Torino" at Grugliasco (Italy) were used. Only the summer periods of 2005, 2006 and 2007 were considered. The analysis is performed following two steps. The first consists of the estimation of ET from the land surface energy budget where the term of the sensible heat flux in the air is calculated from wind and temperature profiles measured at the land surface and 2 meters height. The second step consists of the estimation of EF. The results show that for each drying period after a rainfall event, the four principal flux components of the energy balance (i.e., the latent heat flux, the net radiation, the sensible heat flux in the air and the sensible heat flux in the soil) behave similar during daytime. Hence, the flux ratios and, therefore, the evaporative fraction (EF) may be considered constant ("self preservation") over daytime (i.e., between 9:00 and 17:00). However, the EF values vary from day to day due to the influence of the available soil water content; this backs up the fact that the variation of the sensible heat flux in the soil is much slower than that of

the heat fluxes in the air. The above results give additional strength to the EF constancy and the related self-preservation hypothesis. This may be of crucial importance when other ET retrieval techniques are used than the energy balance budget method, such as the ET calculation from remote sensed soil surface temperature acquisition. Since the spatial and temporal variability of soil water content is experimentally available at different locations and depths, the results provide a great potential for further investigation into the relation between soil water exfiltration and EF values.