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Heat transfer during high wind episodes in the marine atmospheric surface layer

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The exact estimate of heat fluxes is of fundamental importance for applications of models at different scales. In the last few years, many scientists have addressed the limitation of the fluxes parameterisation using the Monin Obhukov (M-O) theory in the surface layer especially in the marine environment. Casual factors include non-local effects, i.e. entrainment from large eddies Johanson (2003) or interaction with sea spray particles (Andreas and De Cosmos, 2002). In the latter paper, reanalysis of the HEXOS (Humidity Exchange Over the Sea) data in open sea, indicate sea spray may contribute up to 40 % of the total latent flux for wind speed between 15 ms-1 and 18 ms-1. We first addressed this problem considering the basic issue of the correlation coefficient between humidity q' and temperature T' fluctuations defined as RqT = <q'T'>/sqsT, where <q'T'> is the q,T mean covariance, and sq and sT the standard deviations of q and T respectively. Both q and T are scalars, which are transported by turbulence, therefore it should be RqT = 1. Sempreviva and Gryning (1996, 2000) and Sempreviva and Højstrup (1998), found that RqT seldom reaches such a value in the surface layer. Here, we examine correlation coefficients for the scalars q, T and CO2 in the marine surface layer using half hour average turbulent fluxes of moisture (<w'q'>), heat (<w'T'>), CO2 (<w'CO2'>) and marine aerosols concentrations collected during an intensive campaign performed under the EU MEAD (Marine Effects of Atmospheric Deposition) project at a Swedish coastal site and during the Danish Galtahea III Cruise, where different sonic anemometers and fast sensors to measure humidity, CO2 and particles have been used. We have chosen periods with high wind speed, estimated spectra and co-variances from different sensors and

considered the effect of sea spray and boundary layer height.