



A Comparison between Temperature Spectra and Webb corrected Humidity and CO₂ Spectra in the Marine Boundary Layer

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Open path density measurements of CO₂ are contaminated by simultaneous fluctuations of temperature and water vapour. Analogously, the water vapour density measurements are contaminated by temperature fluctuations (although these measurements less affected). Turbulent fluxes calculated from such measurements have to be corrected to get the true fluxes, commonly called the Webb correction. Likewise, the corresponding spectra and cospectra suffer from the same contamination. However, the traditional Webb correction is applied on the mean fluxes, i.e. it does not correct the spectra.

Data collected at the Östergarnsholms site in the Baltic Sea have been used to evaluate a method for correcting measurements of CO₂ and water vapour density with an open-path infrared gas analyzer. This method converts the high frequency density measurements of carbon dioxide and humidity to mixing ratio relative to dry air. Thus contributions to the CO₂ density fluctuations caused by temperature and humidity fluctuations are removed, as are contributions from temperature fluctuations to the water vapour density fluctuations. The resulting turbulent fluxes using this method are shown to be equivalent to the fluxes corrected with the Webb correction.

By using the corrected 20 Hz time series the resulting spectra of CO₂ and water vapour are automatically corrected and a comparison between scalar spectra in the marine boundary layer has been conducted.