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Micrometeorological flux measurements at a coastal site

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The eddy covariance (EC) technique is the only direct measurement of the momentum, heat, and trace gas (e.g. water vapor, CO_2 and ozone) fluxes. The measurements are expected to be most accurate over flat terrain where there is an extended homogenous surface upwind from the tower, and when the environmental conditions are steady. Additionally, the one dimensional approach assumes that vertical turbulent exchange is the dominant flux, whereas advective influences should be negligible. The application of EC method under non-ideal conditions, for example in complex terrain, has yet to be fully explored.

To explore the possibilities and limitations of EC technique under non-ideal conditions, an EC system was set up at Selles beach, Crete, Greece (35.33°N, 25.71°E) in the beginning of July 2012. The dominant wind direction was west, parallel to the coast. The EC system consisted of a sonic anemometer (CSAT3 Campbell Scientific), an infrared open-path CO_2/H_2O gas analyzer (LI-7500, Li-COR Biosciences) and a fast chemiluminescence ozone analyzer (enviscope GmbH). All the signals of these fast response instruments were sampled at 10 Hz and the measurement height was 3 m. Besides, another gradient system was setup. Air temperature, relative humidity (HYGROMER MP 103 A), and wind speed (WMT700 Vaisala) were measured every 10 seconds at 3 heights (0.7, 1.45, 3 m). Air intakes were set up at 0.7m and 3m. A pump drew the air through a flow system and a telflon valve alternately switched between the two heights every 30 seconds. H_2O, CO_2 (LI-840A, Li-COR Biosciences) and ozone mixing ratio s (model 205, 2BTechnologies) were measured every 10 seconds.

Momentum, heat, CO_2 and ozone fluxes were evaluated by both EC and gradient technique. For the calculation of turbulent fluxes, TK3 algorithm (Department of Micrometeorology, University Bayreuth, Germany) was applied. We will present the measured fluxes of the two systems and assess the data quality under such non-ideal condition.