On the calculation of daytime CO_2 fluxes measured by automated closed transparent chambers

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Automated transparent chambers have gained increasing popularity in recent years to continuously measure net CO_2 fluxes between low-statured canopies and the atmosphere. In this study, we carried out four field campaigns with chamber measurements in a variety of mountainous grasslands. A mathematical stationary point in the CO_2 time series was found in a substantial fraction of the measurements at all the sites, which had a significant influence on the performances of the regression algorithms. The stationary point was probably due to condensed water on the inner wall of the chamber dome, which reduced the solar radiation and resulted in a reversal of the CO_2 concentration time series in the chamber (so called *Clouded-Glass Effect* or CGE in this study). This effect led to poor performances of linear regression algorithms and the exponential regression algorithm using the entire time series, which result in an underestimation of CO_2 fluxes. In order to avoid biased flux estimation of daytime CO_2 fluxes, we introduced a linearly increasing term to the exponential function so as to compensate for the influence of the CGE, which gives acceptable model errors. We conclude that the linear regression algorithms should be abandoned, while the exponential regression should either be confined to the measurement length defined by the stationary point, or use the modified version to account for the CGE.