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The effect of systematic measurement errors on atmospheric CO₂ inversions: a quantitative assessment

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Abstract. Surface-atmosphere exchange fluxes of CO₂, estimated by an interannual atmospheric transport inversion from atmospheric mixing ratio measurements, are affected by several sources of errors, one of which is experimental errors. Quantitative information about such measurement errors can be obtained from regular co-located measurements done by different laboratories or using different experimental techniques. The present quantitative assessment is based on intercomparison information from the CMDL and CSIRO atmospheric measurement programs. We show that the effects of systematic measurement errors on inversion results are very small compared to other errors in the flux estimation (as well as compared to signal variability). As a practical consequence, this assessment justifies the merging of data sets from different laboratories or different experimental techniques (flask and in-situ), if systematic differences (and their changes) are comparable to those considered here. This work also highlights the importance of regular intercomparison programs.

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