Improving the fundamental equation of eddy covariance for application to flux measurements

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Objectives

- **Resolve inconsistencies in the conventional eddy covariance theory used to measure fluxes of trace gases and water vapor from landscapes**
- **Recommend practices to improve flux measurements of trace gases and water vapor**

New Science

- **The eddy covariance concept was reformulated to provide a general and self-consistent theory for application to both open- and closed-path technologies**
- **The reformulated theory suggested a new direction for next generation of eddy covariance technologies that would employ N_2 or Ar gas as a tracer to better resolve flux processes over target surfaces**
- **Recommendations to the global flux community: 1) Flux calculations should stop assuming no vertical flux of dry air, 2) datasets should be reprocessed to account for this adjustment, 3) improved systems for measuring vertical changes in trace gas storage must be an integral part of the eddy covariance instrumentation at flux sites**

Significance

- **The findings of this study, if adopted by the global flux community, will result in improved datasets for better understanding ecosystem carbon processes and for testing carbon cycle models**
- **Our recommendations should stimulate the development of new analyzers for measuring trace gas fluxes**

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