Geophysical Research Abstracts
Vol. 12, EGU2010-13985-1, 2010
EGU General Assembly 2010

Inversion of convective representations : theory, practical implementation and applications

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Starting from a representation of convection in terms of large-scale tendencies in the budgets of heat and moisture, we have developed an inversion method to retrieve an equivalent process-based representation that provides convective mass-flux, detrainment rate and large-scale evaporation rate. The practical implementation of the method is demonstrated for both undiluted and diluted ascent within convective plumes. The method has a number of applications for analysing data, model comparison, and as a basis for modelling. As an example, insights on convective processes are shown to derive from inversion of the TOGA-COARE dataset. We also discuss possible applications to reconstruct the distribution of convective tracers, and show results obtained on the distribution of water vapour isotopologues after coupling with an isotopic fractionation model.