Geophysical Research Abstracts
Vol. 20, EGU2018-10281, 2018
EGU General Assembly 2018

Time evolution of moisture and CAPE within convective events using rain cell tracking

Christopher Moseley (1), Olga Henneberg (2), and Jan O. Haerter (2)

(1) Max-Planck-Insitut fuer Meteorologie Hamburg, Atmosphaere im Erdsystem, Hamburg, Germany (christopher.moseley@mpimet.mpg.de), (2) Copenhagen University, Niels Bohr Institute, Copenhagen, Denmark

We present a rain cell and cloud tracking algorithm which is particularly suited for recording the life cycles of convective events. As these events can either be isolated from others, or could interact among each other, it is required to put special effort into the treatment of merging and splitting events. This allows the study of interaction between convective updrafts in the course of their evolution. A special parameter, which we term the "threshold ratio", controls the sensitivity of the algorithm with respect to merging and splitting: That is, it controls if such an event leads to a termination of a track and to the initiation of other ones, or not. Importantly, the method further allows to include auxiliary fields, which are collocated with the primary field. The Fortran 90 code is freely available and documented.

We give a detailed analysis of the tracking algorithm and its strengths and weaknesses, as well as its sensitivity to the threshold ratio, the temporal and spatial resolution of the tracked dataset, and the cutoff value for precipitating/non-precipitating areas. As a test case, we use high-resolution large eddy simulation data (200 m horizontal resolution) to identify spatially contiguous precipitation events. We then produce event tracks by further demanding temporal connectedness from one time step to the next. By averaging over each time step of tracks of similar durations, we obtain a reasonably generic picture of event life cycles. We then analyze several auxiliary fields, namely anomalies of temperature and moisture, convergence, convective available potential energy (CAPE) and inhibition (CIN), as well as event area. We find that many of these quantities show rather generic, often nearly linear, relations to the total precipitation amount accumulated by a precipitation event track, in particular, the associated CAPE, CIN, moisture and event area. Our results speak to possible simplified descriptions of convective precipitation events in larger-scale models. Through its simplicity, our tracking code may be useful also in other problems in weather and climate.