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Tracking Method for convective rain cells

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A rain cell tracking method for temporally and spatially high resolved precipitation data is presented. The method is designed to identify clearly distinct convective precipitation cells, and to follow their movement with the flow field. For each track, the size, the precipitation intensity, the position of the cell center, and the flow velocity, are recorded as a function of time. Further, the beginning and the end of a precipitation cell is recorded: A distinct cell can begin its life cycle by just emerging at a place where there was no rain before. Alternatively, it is possible that it separates off from a connected precipitation area, or that more than one smaller cells merge to one. Accordingly, a life cycle can end by a simple dissolution of the rain event, or by a merging to another connected area, or by splitting up into several cells. The information provided by the method allows to study the life cycles of convective cells.

We apply the method on a high resolved dataset of rainfall intensities derived by radar data over Germany, with a high temporal (5 minutes) and spatial (1x1 km) resolution for the years 2007 and 2008. Flow velocities are derived from the movement of the cells and compared to the flow situations found in ERA-Interim reanalysis data. Additionally, synoptic observations allow to distinguish between predominantly convective, and predominantly stratiform cloud conditions. We study the statistics of cell life cycles and their response to atmosphere temperatures from reanalysis data, and to the synoptic conditions. Further, the sensitivity of the method to a decrease in temporal and spatial resolution is tested.

The method could be used to validate the precipitation patterns generated by convection resolving climate models.