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Convective organization described by wavelet spectra in large eddy simulations

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Deep convection and especially its organization play an important role for weather as well as climate predictions. Various convection types (scattered convection, supercells or mesoscale convective systems like squall lines) act on different temporal and spatial scales. The degree of convective organization is determined by the large scale forcing, e.g. fronts or troughs. The simple convective aggregation index (SCAI, Tobin et al., 2012) and simple index of organization (Iorg, Tompkins and Semie, 2017) characterize convective organization over a given domain. However, they strongly depend on the used horizontal grid.

We define convective organization from another perspective. A wavelet decomposition of rain rate provides information about scale and orientation. Wavelet spectra are comparable to Fourier spectra, but additionally for each scale and direction they contain information about the location of the different organized cells. Thus, we are able to distinguish between scattered convection (scales around 3 km, no preferred direction), strong cells or even supercells (scales around 20 km) and mesoscale systems like linear organized convection (up to 100 km, clear preferred direction).

We use the output of a large eddy model (ICON-LEM) with horizontal grid spacing about 156 m over Germany within the *High definition clouds and precipitation for advancing climate prediction* (HD(CP)^2) project to link the results from the wavelet decomposition to environmental characteristics like wind shear, helicity or vorticity and to investigate the influence of the large scale forcing on convective organization. Due to the huge amount of data only a few real case studies can be performed, but the high-resolution fully 3D variables allow a detailed analysis of the convective cells' dynamics.