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# Analysis of the multiscale interactions of convection

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Convection associated with West African monsoon more than often constitutes of multiscale processes. In spite of this well documented observational fact, to our knowledge, little objective analysis is performed in order to quantify these multiscale interactions processes from nonlinear dynamics point of view.

A simulation of organized convection during the HAPEX period is adopted as a testing case. The simulation uses three nested domains. The innermost domain resolves the convective systems explicitly, whereas the outermost domain is taken large enough to cover the whole associated synoptic system.

In order to quantify the nonlinear interactions of the system, the energy cycle is analyzed in the Fourier space. A particular Fourier transform method adopted explicitly considers the horizontal fluxes over the side boundaries of the simulation domain separately from horizontal fluxes (nonlinear advection) within the domain.

Our analysis suggests that it is rather misleading to consider these multiscale nonlinear interactions of monsoonal convective systems in analogy with the energy cascade for the fully developed turbulence. Unlike the standard homogeneous freely-decaying turbulence, the convective motions are chiefly driven by buoyancy forcing associated with condensative heating, which is overall balanced by the vertical advection, as the case for the maritime deep convection. The energy cascade for the horizontal component of the kinetic energy plays only a minor role.