Persistence behaviour of heat and momentum fluxes in convective surface layer turbulence

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The characterization of heat and momentum fluxes is of paramount importance for a plethora of applications, ranging from engineering to Earth sciences. Nevertheless, how the turbulent structures associated with velocity and temperature fluctuations interact to produce the emergent flux signatures, is not evident till date. We investigate this by studying the switching patterns of intermittently occurring turbulent fluctuations from one state to another, a phenomenon called persistence. We discover that the persistence patterns for heat and momentum fluxes are widely different. Moreover, we uncover power-law scaling and length scales of turbulent motions that cause this behavior. Furthermore, by separating the phases and amplitudes of flux events, we explain the origin and differences between heat and momentum transport in convective turbulence. Our findings provide new understanding on the connection between flow organization and flux transport, two cornerstones of turbulence research.