Spatio-Temporal Chaos In Rayleigh-Benard Convection

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One of the unique features of nonlinear dissipative spatially-extended systems is the existence of patterns which vary irregularly both in time and in space. We refer to this phenomenon as spatio-temporal chaos (STC). Rayleigh-B\'enard convection (RBC) has become a paradigm for its study. This talk will review briefly the main features of spiral-defect chaos which occurs well above the onset of RBC, but then will concentrate on quantitative studies of domain chaos (DC) in RBC with rotation about a vertical axis. DC occurs {\it immediately} above a supercritical bifurcation to convection, thus inviting the hope that it can be understood theoretically in terms of weakly-nonlinear theories in the form of Ginzburg-Landau and/or Swift-Hohenberg equations. Unfortunately the predictions of these models are inconsistent with experimental measurements of the two-point correlation length, and a clear understanding of even this relatively simple example of STC is not yet at hand. New real-space analyses of the wavevector field of experimental images of DC will be presented which, it is hoped, will lead to greater insight into the difficulty.