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Spatiotemporal chaos in the dynamics of buoyantly unstable chemical fronts M.P.M.A. BARONI, A. DE WIT, Nonlinear Physical Chemistry Unit, Université libre de Bruxelles (ULB), CP 231, 1050 Brussels, Belgium — Nonlinear dynamics resulting from the interplay between diffusive and buoyancy-driven Rayleigh-Taylor (RT) instabilities of autocatalytic traveling fronts are analyzed numerically for fronts traveling in the gravity field and for various values of the relevant parameters. These are here the Rayleigh numbers of the reactant A and autocatalytic product B as well as the ratio $D = D_B/D_A$ between the diffusion coefficients of the two key chemical species. The interplay between the coarsening dynamics characteristic of the RT instability and the fixed short wavelength dynamics of the diffusive instability can lead in some regimes to complex new dynamics dominated by irregular succession of birth and death of fingers. By using spectral entropy measurements, we show the possibility of a transition between order and spatial disorder in this system. The analysis of the power spectrum further allows to identify similarities between the various spatial patterns while phase space representation is also discussed.

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