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Pattern-fluid interpretation of chemical turbulence GERD SCHROEDER-TURK, Murdoch University, Perth, CHRISTIAN SCHOLZ, KLAUS MECKE, Friedrich-Alexander Universitt Erlangen-Nrnberg, Germany — The spontaneous formation of heterogeneous patterns is a hallmark of many nonlinear systems, from biological tissue to evolutionary population dynamics. The standard model for pattern formation in general, and for Turing patterns in chemical reaction-diffusion systems in particular, are deterministic nonlinear partial differential equations where an unstable homogeneous solution gives way to a stable heterogeneous pattern. However, these models fail to fully explain the experimental observation of turbulent patterns with spatio-temporal disorder in chemical systems. Here we introduce a pattern-fluid model as a general concept where turbulence is interpreted as a weakly interacting ensemble obtained by random superposition of stationary solutions to the underlying reaction-diffusion system. The transition from turbulent to stationary patterns is then interpreted as a condensation phenomenon, where the nonlinearity forces one single mode to dominate the ensemble. This model leads to better reproduction of the experimental concentration profiles for the "stationary phases" and reproduces the turbulent chemical patterns observed by in Chaos 1, 411, 1991. This abstract represents the work published in PRE 91, 042907, 2015.

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