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Complex Solitary Wave Dynamics, Pattern Formation, and Chaos in the Gain-Loss Nonlinear Schrödinger Equation[1] JUSTIN ANDERSON, LINCOLN CARR, Colorado School Of Mines, MINGZHONG WU, Colorado Statue University — Complex solitary wave dynamics, pattern formation and chaos are numerically studied in the context of spin wave envelopes in magnetic thin film active feedback rings and analogous driven damped nonlinear physical systems. Distinct dynamical behaviors of the gain-loss nonlinear Schrödinger equation were numerically identified during a parameter space exploration utilizing over 180 000 core hours of simulation. Numerically identified dynamical behaviors include: spatially symmetric/asymmetric interactions of solitary wave peaks; dynamical pattern formation and recurrence, intermittency, steady state solutions and chaotically modulating bright soliton trains. Ten new dynamical behaviors, eight demonstrating long lifetimes, are predicted to be observable in experiments.

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