Physica D: Nonlinear Phenomena

Volume 54, Issue 3, 1 January 1992, Pages 203-219

Coupled nonlocal complex Ginzburg-Landau equations in gasless combustion

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https://doi.org/10.1016/0167-2789(92)90035-L

Abstract

We consider the evolution of a gasless combustion front. We derive coupled complex Ginzburg-Landau type equations for the amplitudes of waves along the front as functions of slow temporal and spatial variables. The equations are written in characteristic variables and involve averaged terms which reflect the fact that in the slowest time scale, the effect on one wave, of a second wave traveling with the group velocity in the opposite direction on the intermediate time scale, enters only through its average. Solutions of the amplitude equations in the form of traveling, standing, and quasiperiodic waves are found, and regions of stability for these solutions are determined. In particular we find that the traveling and quasiperiodic (including standing) waves are not stable simultaneously. Finally, we observe that the stability analysis for coupled complex Ginzburg-Landau equations with averaged terms differs from that for coupled complex Ginzburg-Landau equations with the averages removed.

1 Supported in part by DOE Grant DE-FG02-87ER25027 and NSF Grant CTS 9008624.

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