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Travelling wave solutions to nonlinear Schrodinger equation with self-steepening and self-frequency shift

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We investigate exact travelling wave solutions of higher order nonlinear Schrodinger equation in the absence of third order dispersion. We show that this system possesses a rich solution space with a nontrivial self phase modulation. It is found that localized solutions to this system can be identified with separatrix of a nonlinear ordinary differential equation. Interestingly, hydrodynamic equation governing the intensity dynamics turn out to be KdV and modified KdV equations, which are true hydrodynamical equations governing swallow water waves.

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