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Formation of wave packets in the Ostrovsky equation for both normal and anomalous dispersion (Article)

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Abstract

It is well known that the **Ostrovsky equation** with **normal dispersion** does not support steady solitary waves. An initial Korteweg-de Vries solitary **wave** decays adiabatically through the radiation of long waves and is eventually replaced by an envelope solitary **wave** whose carrier **wave** and envelope move with different velocities (phase and group velocities correspondingly). Here, we examine the same initial condition for the **Ostrovsky equation** with **anomalous dispersion**, when the **wave** frequency increases with wavenumber **in** the limit of very short waves. The essential difference is that now there exists a steady solitary **wave** solution (**Ostrovsky** soliton), which **in** the small-Amplitude limit can be described asymptotically through the solitary **wave** solution of a nonlinear Schrödinger **equation**, based at that wavenumber where the phase and group velocities coincide. Long-Time numerical simulations show that the emergence of this steady envelope solitary **wave** is a very robust feature. The initial Korteweg- de Vries solitary **wave** transforms rapidly to this envelope solitary **wave in** a seemingly non-Adiabatic manner. The amplitude of the **Ostrovsky** soliton strongly correlates with the initial Korteweg-de Vries solitary **wave**.