SOLITON STRUCTURES IN DIFFERENT ASTROPHYSICAL SYSTEMS

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Abstract. Soliton or solitary wave is usual name for the perturbation that takes wave structure with constant amplitude and group velocity. It results whenever the dispersion of the system is balanced by nonlinearity. Mathematically speaking, it means that soliton is solution of integrable nonlinear equation. There are many astrophysical systems that are subject of no vanishing nonlinear terms and they can be identified as solitons.

One good example is the spiral galaxy; spirals can exist for a very long time due to mentioned balance and using this approach it was possible to overcome wind-up dilemma as a consequence of linearized equations. This is example of one-dimensional soliton, similar to ocean gravity waves.

Next, there are accretion disks which are able to be described by so-called two-dimensional solitons. Similar structures are Jupiter red spots, some structures in the Earth's atmosphere and ionosphere.

Why solitons are so exclusive? All advantages, as well as catastrophic consequences, of having possible for solitons to create, will be discussed.

This theory can be applied in some other systems that follow the nonlinear dynamics, stock market, for example.

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