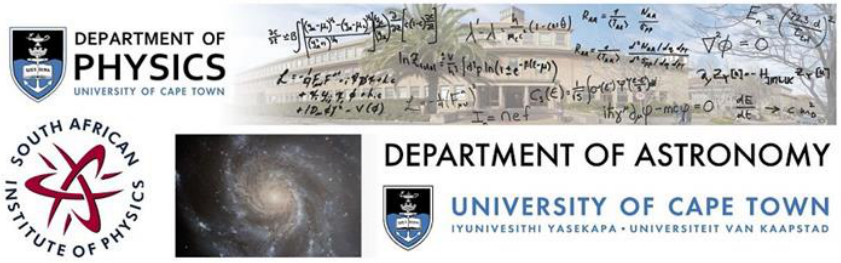

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A small-amplitude study of solitons near supercritical points

Tuesday, 5 July 2016 10:20 (20 minutes)

Abstract content
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We study supercritical points in parameter space for a general fluid model consisting of an arbitrary number of species, each with a number of compositional parameters, such as temperatures and number densities. The approach uses a two-dimensional Taylor series of the Sagdeev potential expanded about both the acoustic speed and the equilibrium electrostatic potential. We show that a sech-type soliton arises at such a supercritical point, in agreement with results of Verheest et al. [1]. A small perturbation in parameter space results in a number of possibilities, depending on the "direction" of the perturbation. These possibilities include coexistence and acoustic speed double layers. A novel finding in this study is the description of small-amplitude supersolitons. Our analysis allows us to determine the exact existence criteria for these structures, as well as lower and upper bounds of the Mach numbers and amplitudes of the structures. We therefore establish an interesting link between supercritical points and supersolitons.

Reference:
[1] F. Verheest, C. P. Olivier and W. A. Hereman, J. Plasma Phys. 82, 905820208 (2016).

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