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Hydrodynamics, all orders gradient expansion and beyond

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Hydrodynamic gradient expansions are in general divergent series. As a typical property of nonlinear systems, the late terms of the series grow factorially and in order to have a well defined answer, the usual hydrodynamic gradient expansion is required to be supplemented by an infinite tower of exponentially damped terms which are non-hyrodynamic modes. In this work we analyze in a concrete way such an enhanced gradient expansion for a plasma that undergoes a boost invariant expansion. We show that, remarkably, the usual hydrodynamic gradient expansion carries information about the non-hydrodynamic modes. Moreover different non-hydrodynamic modes are also interrelated in a similar fashion. We explain precisely how to extract that information and also discuss various resummation techniques that can be useful to improve the accuracy numerical computations.

On behalf of collaboration:

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