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**Nonlinear Collective Field Theory for models with inverse square interaction and exchange** FABIO FRANCHINI, SISSA, Trieste (Italy), MANAS KULKARNI, Stony Brook University and Brookhaven National Laboratory, ALEXANDER ABANOV, Stony Brook University — We present fully nonlinear dynamics [1] in inverse square models such as spin-Calogero model and Haldane-Shastry model. Hydrodynamic equations of motion are written for these models in the regime where gradient corrections to the exact hydrodynamic formulation of the theory may be neglected. We then show how this collective field theory allows to calculate correlation functions [2] that cannot be considered with conventional bosonization. We will also present the case of including external harmonic confinement [3] and show that the Calogero family is strikingly similar to models with delta (short-ranged) interaction and can be used as a toy model for cold atom experiments. Including harmonic trap usually ends up destroying integrability. However, Calogero family is special in this regard and the system remains integrable. In addition, we will present results of collective field theory which include gradient corrections thereby enabling us to go beyond gradient catastrophe.

[1] M. Kulkarni, F. Franchini, A. G. Abanov, Phys. Rev. B 80, 165105 (2009)

[2] F. Franchini, M. Kulkarni, Nucl. Phys. B, 825, 320 (2010)

[3] M. Kulkarni, A. G. Abanov, arXiv:1006.0966

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