Weak solution for quantum hydrodynamics and Euler-Korteweg fluids

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It will be described some results regarding the existence of weak solutions for the Quantum Hydrodynamics Systems [1],[2],[3] and it will be reviewed some results in the literature for the Euler Korteweg. We show how the recent methods developed C. De Lellis and L. Székelyhidi for the Euler equations can be extended [4] also to Quantum and Euler fluids to analyze well/ill posedness. We show that the system admits infinitely many global-in-time weak solutions for any sufficiently smooth initial data including the case of a vanishing initial density - the vacuum zones. Moreover, there is a vast family of initial data, for which the Cauchy problem possesses infinitely many dissipative weak solutions, i.e. the weak solutions satisfying the energy inequality. Finally, we establish the weak-strong uniqueness property in a class of solutions without vacuum.

[1] P. Antonelli, P. Marcati. On the finite energy weak solutions to a system in quantum fluid dynamics. Comm. Math. Phys., 287 :657-686, 2009.
[2] P. Antonelli, P. Marcati. The quantum hydrodynamics system in two space dimensions. Arch.Rational Mech. Anal., 203 :499-527, 2012.
[3] P. Antonelli, P. Marcati Magneto Quantum Hydrodynamics in preparation
[4] D. Donatelli, E. Feireisl, P. Marcati. Well/ill posedness for the Euler-Korteweg-Poisson system and related problems - arXiv:1408.5063