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Dispersionless limit in the Euler-Korteweg system

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The Euler-Korteweg equations are a modification of the Euler equations which include in the momentum equation a term modelling capillary forces. Mathematically, this supplementary term is of dispersive nature, and after a reformulation the system looks like a degenerate Schrödinger equation. We consider here the behaviour of smooth solutions when the capillary coefficient is very small. When the problem is posed on the full space, we prove that the solutions converge to a solution of the Euler equation. On the half space, we obtain a formal WKB expansion which indicates the presence of a boundary layer. We shall also discuss the question of the limiting problem if the initial data exhibit a phase transition across a layer whose thinness depends on the capillary coefficient.

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