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Nonclassical Dynamics of Laminar Dense Gas Boundary Layers

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While inviscid flows of dense gases have been studied intensively in the past, viscous effects have received much less attention so far. It is the aim of the present study to show that the observed unconventional gas-dynamic behaviour may strongly influence the properties of laminar boundary layers in both accelerated and decelerated external flows. For example, by studying linearly retarded flows it is found that the formation of an unsurmountable separation singularity can considerably be delayed or even avoided by exploiting dense gas effects. A marginal separation singularity then occurs as a limiting case. Its formation is studied both numerically and analytically and traced back to the non-monotonous Mach number variation in the external inviscid flow.

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