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Global Analysis of the Convective Instabilities in Laminar Shock-Wave/Boundary-Layer Interactions SEBASTIEN NIESSEN, University of Liege, KOEN GROOT, Texas A&M University, STEFAN HICKEL, Technische Universiteit Delft, VINCENT TERRAPON, University of Liege — The interaction between a laminar boundary layer and an oblique shock wave is investigated through BiGlobal stability analysis. Previous studies have revealed the presence of a stationary mode (J.-Ph. Boin et al., TCFD 20(3), 2006, and J.-Ch. Robinet, JFM 579, 2007) and a convective instability mechanism (F. Guiho et al., JFM 789, 2016). In the latter analyses, non-localized eigenmodes are obtained that are artificially affected by the finite size of the chosen computational domain. In the present work, we obtain localized wave packets, that are independent of domain size and truncation boundary conditions, by applying the stability analysis in a moving frame of reference. The long-time behavior is subsequently determined by time integration, which results in the propagation of the localized wave packets in the flow. Finally, we highlight the mechanisms constituting the convective instabilities through a Reynolds-Orr energy budget analysis. To obtain the unstable basic state solution to the compressible Navier-Stokes equations, we have coupled Direct Numerical Simulations to the selective frequency damping method.

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