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DNS OF SHOCK BOUNDARY LAYER INTERACTION: STUDY OF THE SHEDDING INTERMITTENCY.

I. Ben Hassan Saïdi[1], C. Tenaud[2] and G. Fournier[3]

[1] LIMSI, CNRS, Univ. Paris-Sud, Université Paris-Saclay, Orsay, France, iben@limsi.fr
[2] LIMSI, CNRS, Univ. Paris-Sud, Université Paris-Saclay, Orsay, France, christian.tenaud@limsi.fr
[3] LMEE, Université d'Évry-Val-d'Essonne, Université Paris-Saclay, Évry, FRANCE, guillaume.fournier@ufrst.univ-evry.fr

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Under certain circumstances (High Mach number, large shock angle...), the interaction between an incident shock wave impinging a boundary layer may create an unsteady separation bubble. This bubble, as well as the subsequent reflected shock, are known to oscillate in a low-frequency streamwise motion that can spread over several tenth of the boundary layer thickness. The origin of those oscillations, however still unclear, has been related either to the shedding of vortices in the mixing layer downstream of the separation, or to the turbulent structures in the incoming boundary layer [1]. An in-house parallel (MPI) Finite-Volume based DNS/LES solver developed at LIMSI-CNRS is used to perform simulations of this problem. In order to reduce the possible causes of unsteadiness to the sole vortex shedding, simulations have been performed for laminar boundary layers, in which no incoming structures are encountered within the boundary layer. In this configuration, low frequency oscillations of the whole shock wave boundary layer interaction system (SWBLI) have not been observed even if a strong intermittency of the shedding responsible for low-frequency reattachment shock oscillations have been evidenced. This tends to suggest the importance of the turbulent structures of the incoming boundary layer in the low frequency oscillations of the SWBLI system [2]. In this context, the accurate simulation of a turbulent compressible incoming boudary layer is of great importance. A Synthetic Eddy Method [3], adapted to compressible flow, have been employed to achieve this objective without prohibitive additional computational costs. Analyses of the SWTBLI dynamics by using a modal decomposition will also be presented at the conference.

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