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Low-order stochastic model for the low-frequency shock motions in shock/boundary-layer interactions EMILE TOUBER, Imperial College London, NEIL SANDHAM, University of Southampton — The need for better understanding of the low-frequency unsteadiness observed in shock wave/turbulent boundary layer interactions has been driving research in this area for several decades. Starting from an exact form of the momentum integral equation and guided by large-eddy-simulation data, a stochastic ordinary differential equation for the reflected-shock foot low-frequency motions is derived. The frequency of the most energetic fluctuations is shown to be a robust feature over a wide range of input parameters in agreement with experimental observations. Under some assumptions, the coupling between the shock and the boundary layer is mathematically equivalent to a first-order low-pass filter. Therefore, it is argued that the observed low-frequency unsteadiness is not necessarily a property of the forcing, either from upstream or downstream of the shock, but simply an intrinsic property of the coupled dynamical system.

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