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Optimal frequency-response sensitivity of compressible flow over roughness elements MIGUEL FOSAS DE PANDO, Dpto. de Ingeniería Mecánica y Diseño Industrial, Escuela Superior de Ingeniería, Universidad de Cádiz, 11519 Puerto Real, Spain, PETER J. SCHMID, Dept. of Mathematics, Imperial College London, London SW7 2AZ, UK — In this work we investigate the global frequency-reponse characteristics of compressible flow over a flat plate with roughness elements, as well as sensitivity characteristics to changes in flow and geometry parameters. Wu (2011) previously considered this configuration as a model for sound generation in wall bounded flows, where acoustic feedback effects were analyzed using asymptotic theory. In the approach followed here, the flow response is assessed by the calculation of the frequency response to optimal forcings for varying frequency at a given flow parameter choice. Even though the computational cost associated with the resolvent analysis renders parametric studies intractable, first-order sensitivity information can still be obtained from a weighted inner product between the optimal forcing and optimal response. This information will allow us to investigate the destabilizing effects of acoustic feedback and baseflow changes.

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