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The Propagation of Nonlinear Pressure Waves Through Regions of Non-Uniform Temperature NICHOLAS DIZINNO, GEORGE VRADIS, VOLKAN OTUGEN, Polytechnic University — A numerical study of wave propagation through gases with non-uniform temperature distributions will be presented. The aim of this study is to determine the impact of temperature gradients on high-intensity pressure waves of various initial wave forms. Emphasis is paid to wave reflection and transmission. Ultimately, the performance of thermal barriers in attenuating nonlinear waves is evaluated. The concept of using regions of hot gas inside an ambient environment has potential in aeroacoustic applications, such as jet screech mitigation. This analysis considers the one-dimensional compressible unsteady Euler's equations with an ideal gas state equation. The domain is composed of two regions with uniform and equal gas properties separated by a third region with higher gas temperature (lower density). Pressure is uniform throughout the domain. We introduce various high-intensity wave forms into this medium. Our investigation studies how the shape and extent of the thermal zone affect transmission and reflection of the wave. This is done for a range of wave and thermal field parameters. A Fourier analysis will study the frequency content of the incident, transmitted and reflected waves. These results will help determine the effectiveness of using thermal barriers for nonlinear wave attenuation.

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