

# Geometric Acoustics in a Hypervelocity Boundary Layer

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## **Abstract**

The mechanism driving hypervelocity boundary layer transition can be acoustic in nature. The acoustic instability is present when there are sufficient velocity and sound-speed gradients in the flow. Geometric acoustics can provide new insight into high-speed boundary layer instability by providing a new vantage point from which to study this subject. In this work, we outline the basics of geometric acoustics, apply the ray-tracing technique to test problems, and then apply what we know to more relevant problems. In particular, we compare the "acoustic refractivity" of boundary layers on supersonic and hypervelocity vehicles, and then give an example of ray-tracing in a hypervelocity boundary layer.