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Anomalous infrasound propagation in a hot stratosphere and the existence of extremely small shadow zones

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Long range infrasound propagation strongly depends on the state of the stratosphere. In summer conditions the atmosphere behaves stable. Contradictory, in winter, the atmosphere is much more variable which has a significant influence on infrasound propagation. The aim of this study is to analyze the temperature effect in the stratosphere on infrasound propagation. A case study is presented from an explosion during a Sudden Stratospheric Warming. During such conditions, the size of the classical stratospheric shadow zone ($\sim$200 km) appeared to be reduced by a factor of two. The occurrence of such conditions is quantified by evaluating ten years of atmospheric specifications. It unexpectedly appeared, that the size of shadow zone can become smaller than 100 km which is confirmed by evaluating infrasound detections from mining blasts in southwestern Siberia, Russian Federation. These results are valid over a latitudinal range of 20N to 60N, which is determined by the stratospheric surf zone.