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## Infrasound transmission in the "shadow zone" observed on balloons in the lower stratosphere

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The temperature and wind structure of the lower atmosphere creates an "acoustic shadow", where acoustic propagation is not expected to occur from a ground based source. This region begins several tens of kilometers from the source and typically ends between one hundred and two hundred kilometers range in the downwind direction of the stratospheric jet. Ground microbarometers still occasionally record acoustic arrivals in this zone due to tropospheric waveguides and/or scattering off of stratospheric structure not accounted for in atmospheric models. However, the properties of these signals in the lower stratosphere (above the tropospheric duct) is unknown, because they have never been previously observed on sensors at these altitudes. Here we present a set of acoustic arrivals from ground explosions recorded on balloons in the lower stratosphere during the mini-BOOSTER campaign in Sweden. Although some of the balloons were in the shadow zone, they still recorded a variety of waveforms from each event. Dual payloads on tethers show that the acoustic waves came from below in these instances. We discuss the provenance of these signals and implications for acoustic transmission in regions where geometric ray theory predicts their absence.