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Prospects for infrasound bolide detections from balloon-borne platforms

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We report on an experiment to assess whether balloon-borne instruments can improve sensitivities to bolides exploding in the Earth's atmosphere (essentially using the atmosphere as a witness plate to characterize the small end of the NEO (Near Earth Object) population). The CTBTO's infrasound network regularly detects infrasound disturbances caused by bolides, including the 15-FEB-2013 Chelybinsk impact. Balloon-borne infrasound sensors should have two important advantages over ground-based infrasound stations: there should be virtually no wind noise on a free-floating platform, and a sensor in the stratosphere should benefit from its location within the stratospheric duct. Balloon-borne sensors also have the disadvantage that the amplitude of infrasound waves will decrease as they ascend with altitude. To test the performance of balloon-borne sensors, we conducted an experiment on a NASA high altitude (35 km) balloon launched from Ft Sumner, NM on 28-SEP-2016. We were able to put two independent infrasound payloads on this flight. We arranged for three 3000-lb ANFO explosions to be detonated from Socorro, NM at 12:00, 14:00 and 16:29:59 MST. The first two explosions were detected from the NASA balloon, with the first explosion showing three separate waveforms arriving within a 25-s span. The peak-to-peak amplitude of the waveforms was about 0.06 Pa, and the cleanest microphone channel detected this waveform with an SNR greater than 20. A second balloon at 15 km altitude also detected the second explosion. We have signals from a dozen ground stations at various positions from Socorro to Ft Sumner. We will report on wave propagation models and how they compare with observations from the two balloons and the various ground-stations.