High Quality Observations of Sonic Booms
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Surface Response to Pressure Wave
Sonic booms from space shuttle re-entry are readily detectable on modern seismographs (Kanemori et al., 1991; Gelfand et al., 2002). The figure on the left shows a record of a sonic boom from an F-18 at Edwards AFB. The trace in green is a microphone in the free field, and the green line shows the vertical displacement from nearby CUD seismometer (3). The displacement is integrated from velocity to obtain the record with a microphone reference. The initial sonic boom phase, however, has a characteristic shape which is easily discernible in displacement traces when integrated from velocity.

In a separate set of booms as part of the WSPR experiment, we instrumented Building 4800 on the NASA Dryden campus with high rate accelerometers as the foundation and two accelerometers on the roof above the lower pair. The figure at right shows the spectral ratios of the vertical and horizontal components of the roof sensor to the lower sensor.

Because sonic booms are detonated by much higher frequencies than earthquakes, building response is best illustrated in frequencies over 50 Hz. The building shows significant amplification in the horizontal channels between 75 and 120 Hz, while the amplification in the vertical channel is predominantly in the 400–800 Hz range.