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Seismo-acoustic signals of the 2013 Russian meteor recorded across Central and Northern Europe

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The meteor over Russia entering the Earth's atmosphere on 15 February 2013 around 03:20UT near the city of Chelyabinsk was the largest since the 1908 Tunguska fireball. As such the shock waves generated by this event were observed at infrasonic stations globally, in particular the network of some 45 of the planned 60 infrasound systems of the International Monitoring System (IMS) being deployed for the verification of the Comprehensive Nuclear Test-Ban Treaty (CTBT). Furthermore the shock waves coupling into the ground near the source location were observed as Rayleigh waves at seismic stations to distances of more than 4000 km.

Beyond the acoustic observations that were made at infrasound sensors we report here on additional observations of the acoustic waves which have coupled into the Earth at the receiver. The corresponding observations were made in Central Europe, in particular at the Gräfenberg broad-band array, as well as in Northern Europe (NORSAR in Scandinavia and on Spitsbergen), where also broad-band seismic array stations are located. That indeed the acoustic arrival from the bolide was recorded can be confirmed by frequency-wavenumber analyses giving compatible velocities and back-azimuths for the ground-truth source location over Russia. Theses observations are compatible with IMS station observations and also with shock wave arrivals on seismic stations on the Eurasian platform.