Seismo-acoustic signals of the Baumgarten (Austria) gas explosion detected by the AlpArray seismic network

Schneider, Felix Michael (Institut für Meteorologie und Geophysik, Wien, AUT);
Fuchs, Florian (Institut für Meteorologie und Geophysik, Wien, AUT);
Kolinsky, Petr (Institut für Meteorologie und Geophysik, Wien, AUT);
Caffagni, Enrico (Institut für Meteorologie und Geophysik, Wien, AUT);
Serafin, Stefano (Institut für Meteorologie und Geophysik, Wien, AUT);
Dorninger, Manfred (Institut für Meteorologie und Geophysik, Wien, AUT);
Bokelmann, Götz (Institut für Meteorologie und Geophysik, Wien, AUT);
AlpArray Working Group

On December 12, 2017 a devastating release and combustion of gas occurred at the Baumgarten gas hub in Eastern Austria, which is a major European distribution node for natural gas. We have detected the resulting seismo-acoustic signal on permanent and temporary broadband seismic stations at distances between 30 and 175 km from the gas hub, most prominently in the 2-4 Hz range. Two distinct phase arrivals correspond to acoustic waves traveling through the troposphere and stratosphere. The passing of a cold front shortly before the explosion led to several temperature inversions at low altitude, and acoustic waveguides within the troposphere that facilitated our infrasound detections at distances as close as 50 km from the source, in addition to the commonly observed stratospheric reflections. 3D acoustic raytracing using temperature and wind velocities from the from the HRES (high-resolution) forecast model of the European Center for Medium Range Weather Forecast (ECMWF) has allowed to precisely relate the spatial distribution of our detections with calculated surface bounce points of infrasound rays. This has provided a precise and independent estimate of the time of the accident, to be used in forensic investigations. In addition to the acoustic signal we find evidence for weak seismic phases on the stations closest to the gas hub, yet the sudden release of gas above the surface generated acoustic waves more effectively than seismic waves. After the first explosion signal, we also detect a prolonged coda of elevated noise, which is probably due to ongoing gas release and/or the fire from the escaping gas.