

Observations of infrasound signals produced at the sites of underground mine collapses

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Collapse-induced earthquakes, accompanied by surface subsidence, occurred at two underground mines in South Korea and were followed by impulsive infrasound signals detected at arrays over 200 km. Infrasound location results and atmospheric propagation modeling demonstrate that the infrasound signals can be associated with the accidental underground mine collapses. For explaining infrasound generation from the collapses we hypothesize that excess pressure is excited by rapid outflow of underground air mass into atmosphere, caused by sudden imploding earth into underground space. To validate the physical model, released air volumes are estimated from compact monopole source model and reduced source pressures that are calculated by removing atmospheric attenuation effects from observed infrasound signals. Estimated volumes at each collapse are approximately 0.14 and 0.63 Mm³ respectively, which are agreeable with collapsed volumes inferred from surface subsidence area. This study introduces an infrasound generation model that can be extendable to monitor other catastrophic failure in subsurface man-made or natural cavities.