ID: **P2.4-347** Type: **E-poster**

Explosively Driven Elemental Diffusion in Geological Matrices as Potential Signatures

Thursday, 22 June 2023 11:22 (1 minute)

Exploding wires have been embedded in geologic matrices (concrete, basalt, sandstone, and granodiorite) to study explosive driven elemental diffusion and to elucidate the utility of elemental signatures. The exploding wire detonations have an input energy of up to 900 J equivalent to 0.22 g TNT. Simultaneous to the detonation, monitoring of the air concentration of elements was performed using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) in a parallel hole drilled into the rock sample at various spacings from the exploding wire placement. A wide range of elements (Cu, Zn, Br, Rb, Y, Sn, Sb, Te, I, Nd, Hg and Pb) have been detected propagating through the rock with a range of delays. The Hg pulse usually arrived earliest at the detection location, followed by most other elements. Iodine always displayed the longest arrival delay and remained detectable at the greatest distance, long after any explosion related thermal and pressure gradients should have dissipated suggesting highest mobility.

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Promotional text

Geologic properties influence movement of elements in explosion debris. Through bench-scale explosions, we are exploring how different geology types could change remotely-measured signatures like the ratio of xenon isotopes from an explosion.

Oral preference format

in-person

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Session Classification: Lightning talks: P2.4

Track Classification: Theme 2. Events and Nuclear Test Sites: T2.4 Atmospheric and Subsurface Radionuclide Background and Dispersion