Supporting Information for "Discriminating underground nuclear explosions leading to late-time radionuclide gas leakage"

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Analysis of average high-efficiency periods and amplitudes

Identifying representative periods and amplitudes of barometric components with high barometric-pumping efficiency aids in discriminating underground nuclear explosions (UNEs) that lead to late-time leakage. The first step in this process is to sort the barometric components (periods and amplitudes) associated with an UNE in order of decreasing barometric-pumping efficiency. Next, the cumulative mean is calculated for periods and amplitudes, starting at the highest barometric-pumping efficiency, in order to identify a representative average period and amplitude of high-efficiency barometric components. These efficiency-sorted, cumulative mean periods and amplitudes are shown in the first and third plot in Figure S1. Identifying characteristic high-efficiency average periods and amplitudes from these curves is difficult due to the erratic nature of the curves. Therefore, the curves are smoothed using a moving average approach using a 30 data point window

shown for the cumulative mean periods and amplitudes in the second and fourth plot in Figure S1. Using these smoothed curves, characteristic, high-efficiency mean periods and amplitudes are easily identified as the maximum value along the curves. These values are used as the average high-efficiency periods and amplitudes. Although there is overlap, the leaked UNEs generally have longer high-efficiency periods and higher high-efficiency amplitudes than contained UNEs.

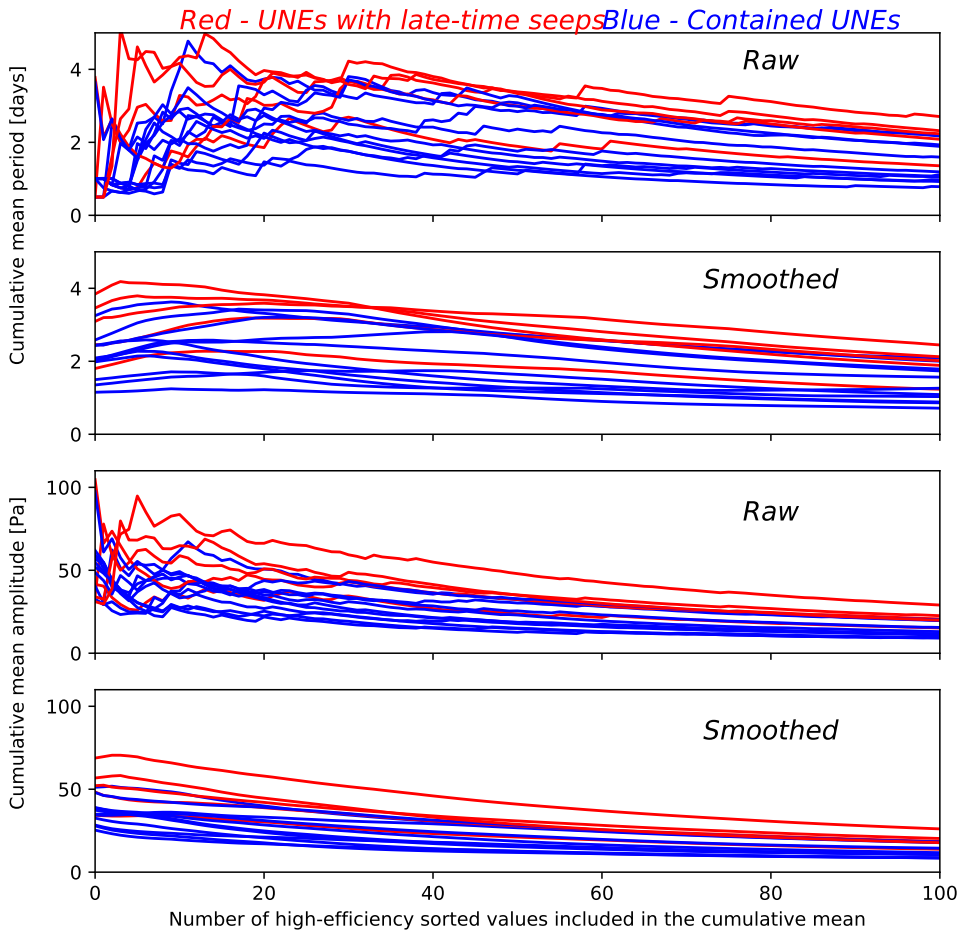

Figure S1. Cumulative mean period calculated in order of decreasing barometric pumping efficiency for raw (non-smoothed) period (top plot) and amplitude (3rd plot) and for smoothed period (2nd plot) and amplitude (bottom plot).