

(30-240329-A) Association between Elevated Airborne Radioactivity and Natural Gas Emissions Downwind of a Colorado Oil Refinery

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Air pollution monitoring was conducted over a full year near the Suncor Refinery in Commerce City, CO. The study included continuous real-time monitoring of airborne radioactivity from both radon gas and radon progenies attached to particulates downwind of an oil refinery. Radon causes an estimated 21,100 annual lung cancer deaths in the United States. Despite radon emissions being well-established in industrial, government, and academic literature, as of 2024, they are not regulated. The monitoring site was located in an environmental justice community with a disproportionately higher percentage of Hispanic residents ($\approx 65.8\%$ of the city population). Gas and particle-associated airborne radioactivity contribute nearly evenly to the total alpha radioactivity. Total radioactivity levels of $30\text{-}40\text{ Bq m}^{-3}$ were 2-3 times higher when winds were light and southwesterly than the $10\text{-}15\text{ Bq m}^{-3}$ background, which suggests the refinery as the geographic origin. Further, elevated radioactivity measurements tracked most closely with the light hydrocarbon and natural gas tracer ethane. These findings suggest that emissions from oil and natural gas processing contribute to the atmospheric burden of radioactive radon and its progenies.

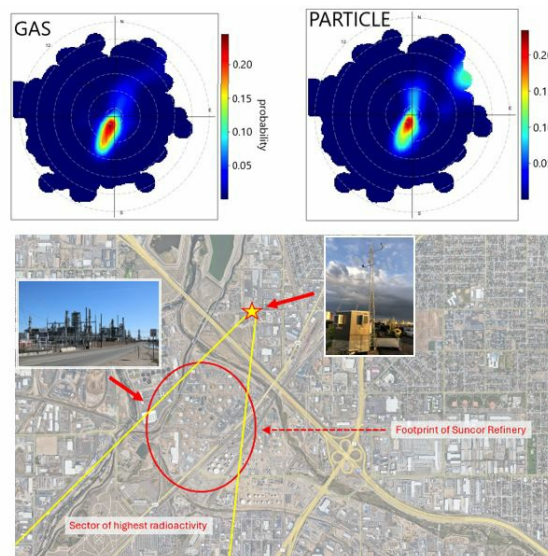


Figure 1. Conditional probability analysis of the 90th to 100th percentile occurrences of gas (left) and particulate (right) radioactivity for 8/30/2022 – 8/2/2023, with a satellite image (Google Earth) showing the Commerce City footprint (bottom). Both plots use a wind speed of $> 1\text{ m s}^{-1}$. The star shows the location of the monitoring shelter, the bounds of the sector with the high radioactivity occurrences is indicated by the yellow lines. The location of the Suncor Refinery is within the red circle.