Potential Local to Regional Scale Impacts from Wildfire Re-emission of Hypothetical Radiological Contamination Incidents

Kirk Baker | *U.S. Environmental Protection Agency*

An Eulerian 3D photochemical transport model was used to estimate potential ambient impacts of Cesium-137 re-emission due to wildfire following hypothetical radiological release scenarios followed by subsequent contamination of forested areas in Denver, CO and Los Angeles, CA. Radiological release events can potentially contaminate wide areas with radiological materials and decontamination efforts are typically focused on populated areas potentially leaving radionuclides in forested areas for long periods of time. Large wildfires in contaminated forested areas have the potential to reintroduce these radionuclides (most notably Cesium-137 [Cs-137] due to its long half-life) into the atmosphere and cause exposure risk to first responders and downwind communities. The Community Multiscale Air Quality (CMAQ) model version 5.2 was applied to an area covering Colorado and California using 4 km sized grid cells and the vertical atmosphere from the surface up to approximately 15 km with emissions from all known anthropogenic (e.g., vehicles, power plants, etc.), biogenic (vegetation), and geogenic (wildland fire) sources. Emissions from a large hypothetical wildfire were introduced into the wildland-urban interface (WUI) near Denver and Los Angeles and included fine and coarse fraction particulate matter Cs-137 emissions. PM Cs distribution values were obtained from a recent laboratory simulation study that examined the partitioning of Cs-133 (a non-radioactive isotope of cesium) between airborne particulate matter (>10 μm, between 2.5 and 10 μm, and <2.5 μm in aerodynamic diameter) and residual non-entrained ash when pine needles and peat were doped with Cs. The photochemical model was applied for an extended period to capture a wide range of meteorological flows common to each area to capture impacts in downwind large populated areas. Additional model simulations were done for an area immediately around these fires at finer (1 km) resolution to provide a better estimate of potential impacts to first responders. Modeled post-incident ambient levels of Cs-137 both near these wildfires and further downwind in nearby urban areas were well below levels that would necessitate population evacuation or warrant other protective action recommendations such as shelter-in-place. These levels also suggest expensive remediation efforts of contaminated forests would not be considered a high priority based on potential exposure from future wildfire smoke.