Environmental Science Graduate Program Student Seminar Series

Modeling Atmospheric Transport of Perfluorinated Alkyl Substances from Chemours Facilities Using CALPUFF View

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Cunz 330 | 11 - 16 - 18 | 3:00 - 4:00 pm

Abstract/Summary:

The Chemours Washington Works (Parkersburg, West Virginia) and Fayetteville Works (Fayetteville, North Carolina) facilities produce fluoropolymers using perfluorinated alkyl substances (PFAS). Historically, these sites used Perfluorooctanoic Acid (PFOA) in the production of fluoropolymers, but due to health concerns and a string of legal issues, was phased out and replaced by Hexafluoropropylene Oxide (HFPO) Dimer Acid, or GenX, which is still in use today. Waste streams from this process includes both aqueous discharge from nearby rivers, and air emissions, which follow the prevailing winds. The Ohio River flows to the southwest away from the Washington Works site, while the Cape Fear River flows to the southeast away from the Fayetteville Works site. The prevailing wind direction is northeast for both Washington Works and Fayetteville Works.

At both sites, PFAS have been detected in downwind surface and ground waters, implying human health risk due to the air emission pathway. However, the extent and amount of contamination is uncertain. The purpose of this study is to model the atmospheric transport of both chemicals at both facilities using CALPUFF – a non-steady-state, long-range transport model. CALPUFF utilizes land use data and terrain data from the United States Geological Survey (USGS), as well as surface and upper air meteorological data. Here, prognostic meteorological data was used for the representative year of 2017. These data are used, along with the geographic inputs, characteristics of the chemicals, and emission information, to calculate dry, wet, and total deposition of each chemical. Modeled deposition rates are evaluated against soil samples and observed wet deposition near the sites, giving a better idea of how these substances behave and how the public is being affected. CALPUFF View (a Graphical Users Interface [GUI] for CALPUFF) is able to model at a larger spatial scale than the physical samples, giving us more insight into how these pollutants travel over time and space. Although it would be suspected to find higher concentrations downstream of the rivers, the model correlates with samples taken and indicates that higher readings are in the direction of the prevailing winds – proving that transportation by air is an important factor to consider in terms of emissions and deposition. The results of this study can be extended to predict atmospheric chemical transport and potential drinking water source contamination at any fluoropolymer manufacturing facility.