Observing technologies in Utqiaġvik, Alaska: Sensing spatiotemporal variance in ground temperatures and particulate matter concentrations in an arctic community

Mirella Shaban[1], Howard E. Epstein[1], Luis F.R. Murillo[2], Tobias Gerken[3], Leena Cho[4], Matthew G Jull[4], MacKenzie Nelson[1], Caitlin D. Wylie[5], Hannah Bradley[5], Lars Nelson[6]

(1) University of Virginia, Department of Environmental Sciences, Charlottesville, VA, United States, (2) University of Notre Dame, South Bend, IL, United States, (3) James Madison University, Harrisonburg, VA, United States, (4) University of Virginia, School of Architecture, Charlottesville, VA, United States, (5) University of Virginia, School of Engineering, Charlottesville, VA, United States, (6) TRIBN LLC, Utqiagvik, AK, United States

Contact information: qwe2qh@virginia.edu[1], hee2b@virginia.edu[1], lrosadom@nd.edu[2], gerkentx@jmu.edu[3], lcho@virginia.edu[4], mj5kh@virginia.edu[4], kus5qy@virginia.edu[1], wylie@virginia.edu[5], vbv9zu@virginia.edu[5], lars.nelson@tribn.pro[6]

Main contact: Mirella Shaban (qwe2qh@virginia.edu)

Effects of the built environment on the natural environment differentially influence spatial and temporal dynamics of both ground temperatures and airborne particulate matter. Using a high resolution and spatially extensive terrestrial micrometeorology array, our team sought to assess the fine-scale effects of buildings on ground temperatures and their driving meteorological variables in Utqiaġvik, Alaska. Four sites were instrumented among three urban sites and one tundra control site in the summer of 2022. Preliminary data from summer and fall of 2022 suggest the presence of warm and cold areas around buildings relative to the surrounding tundra. In addition, dust and air quality have been concerns of Arctic communities in recent years as research further develops on the health impacts of poor air quality on humans and the environment. As interest in air quality continues to grow in Arctic regions, a community-based approach to this research will allow the community of Utqiaġvik to provide valuable input into locations of interest and observations of air quality for methodology development in future stages of this research. In the spring of 2024, an array of innovative low-cost "BigDot" particulate matter (PM) sensors will be deployed at these four terrestrial micrometeorology arrays to accumulate a dataset of high-resolution PM concentration in the community. Quantifying PM at high resolutions in urban areas is important to further our understanding of how infrastructure and human actions may influence air quality over various temporal and spatial scales.