Sara Lance WFM 50th Anniversary Celebration Remarks

November 2, 2022

Thank you, Jim.

I am very grateful to be here with you today to talk about the future of Whiteface.

When I applied for the research faculty position here at ASRC in 2014, the job advertisement indicated a desire for the applicant to make extensive use of the Whiteface Mountain Research Observatory in their research. I immediately felt that the advertised position was a perfect fit for me because the desired field of research in the posting was Experimental study of aerosol-cloud interactions, which had been the focus of both my graduate and postdoctoral research, and because my love of high alpine environments had drawn me to the mountains even before moving to Boulder CO in 2004, where I remained for more than ten years after defending my PhD at GA Tech. Until this job opened at ASRC, I never dreamed I would have an opportunity to lead research conducted at a Premiere mountaintop research station like Whiteface Mountain.

Continuous sampling at mountain research observatories provides access to critical information about long-term changes in regional background atmospheric composition. Two seminal examples, in particular, inspire me: Number 1) The long-term measurement of CO2 obtained at Mauna Loa. These observations demonstrated simply and unambiguously the degree to which human activities can alter atmospheric composition, sounding a global alarm on climate change more than 50 years ago, and Number 2) The long-term measurements at Whiteface Mountain, which have tracked an equally impressive decreasing trend in acid rain and particulate pollution over the past few decades, resulting from The Clean Air Act and Amendments. We need more success stories like these to show that scientific understanding and regulatory interventions can actually make a difference!

These examples demonstrate the power of continuous measurements spanning a decade or more at one location. However, we can’t sit back and assume that our past successes will continue into the future. Human emissions continue to change, even as ecosystems continue to respond to previously emitted pollutants. New and ongoing challenges require that we continue monitoring air pollution at remote sites, and also be on the lookout for emerging threats to human and ecosystem health. A good example of emerging contaminants would be PFAS, which we have begun to measure in cloud water, motivated by increasing evidence linking these persistent pollutants to human health impacts.

Furthermore, basic science is still needed. Our understanding of multiphase chemical processes remains incomplete. We learned decades ago that sulfuric acid and sulfate aerosol is produced through chemical reactions within cloud droplets. Once again, we are learning that cloud droplets provide a unique vehicle for the chemical transformation of aerosols, this time in terms of organic compounds. However, many questions remain about cloud processing of organic matter, which now comprises the largest fraction of aerosol mass and dissolved matter in cloud water.

While organics are complicated (because they are influenced by many sources and undergo reactions in the atmosphere that alter their properties), they cannot be ignored because of their prevalence and their impact on all facets of atmospheric chemistry. Reactions with organics produce ozone and additional particulate mass, two important factors in human health. And recent research has shown that organic aerosols have substantially greater impact on human health, gram for gram, than other aerosol types.

And, at WFM, organic carbon in cloud water has been on the rise, more than doubling in absolute concentration over the past decade. We are only starting to assess the underlying reasons for this major shift in atmospheric chemistry. What we can say is that the growing abundance of organic carbon in cloud water does not appear to be slowing down. Our last year of measurements were the highest concentrations yet reported – I invite you to come look at my poster to see this.

Meanwhile, the United States is poised to undertake a major shift in energy production and usage, in an effort to combat climate change, even as ecological impacts from climate change (like forest fires and drying lakes in the Western U.S.) are growing more and more apparent. Whiteface is an optimal location to provide the essential long-term datasets to constrain these competing impacts to air quality in the North Eastern U.S.

While we have begun to expand our research capacity at WFM, we know that funding for long-term operations is no easy task! as Charles and his son Ralph Keeling at Mauna Loa can attest. In addition, the new chemical regime we are finding ourselves in requires a substantial shift in measurement strategy, which we have already begun to embark on with funding from NYSERDA, NSF and NASA.

Looking forward, we endeavor to partner with other mountain observatories to further build the research infrastructure at Whiteface Mountain and expand our impact by coordinating with international networks. When these efforts are successful, it will be a game changer for Whiteface Mountain, as the needed infrastructure will significantly advance our research capabilities and our ability to attract and support research collaborations at the site. More importantly, it will significantly advance our understanding of atmospheric processes taking place between the gas, aerosol and cloud phases, and lead to better understanding of our shifting climate, as well as air quality gains from energy policy decisions.

I want to end by saying, we treasure our partnership with the DEC and NYSERDA, the likes of which don’t exist in other States. I look forward to continuing the great work that has been done at Whiteface, honoring the past by moving into the future with exciting new science and environmentally important research.