February 28, 2020

Dear Alison Rockwell and Shree Mishra:

I am submitting this letter to inform you of our research team’s intent to submit a request to the National Science Foundation (NSF) Lower Atmosphere Observing Facility (LAOF). This request will be to support a project called WINter precipitation Type REsearch Multi-scale eXperiment (WINTRE-MIX), which we are planning to conduct during January to February 2022. Operations will take place in the vicinity of the Saint Lawrence River Valley, specifically the northern edge of New York State and the southern edge of the Province of Québec. The primary facilities we plan to request are the University of Wyoming King Air (UWKA) aircraft and three CSWR mobile radars.

I, Justin Minder (University at Albany), am leading the organization of this effort. Co-investigators on this LAOF request will include Jeffrey French (University of Wyoming), Katja Friedrich and Andrew Winters (University of Colorado – Boulder), and Nick Bassill (UAlbany). We plan to submit a single collaborative proposal (UAlbany, UWyoming, CU) to the NSF Physical and Dynamic Meteorology Program to support this work.

In addition to the US-based team, we are working closely with a team of Canadian collaborators, including: Julie Thériault (University of Québec at Montréal, UQAM), John Gyakum, Frédéric Fabry, and Dan Kirshbaum (McGill University), and Jason Milbrandt and Ron McTaggart-Cowan (Environment and Climate Change Canada). Their efforts will be funded by a combination of existing funding streams such as NSERC Discovery Grants and/or Canadian Research Chair (Thériault) and, if successful, new funding requests to federal (e.g. NSERC Alliance) and provincial (e.g. Fonds de recherche du Québec) agencies.

The type of precipitation (e.g., rain vs. snow, freezing rain vs. ice pellets) is often difficult to predict when it occurs in near-freezing conditions due to complex multi-scale interactions. However, accurate prediction is important, since societal impacts strongly depend on precipitation type. Observations collected during WINTRE-MIX will be used to improve fundamental understanding of how the interplay between synoptic forcing, mesoscale terrain, airflow dynamics, cloud/precipitation microphysics, and near-surface turbulence influences precipitation type under near-freezing conditions.

We will focus on the Saint Lawrence Valley region along the New York–Québec border in part because it is a region of frequent, diverse, and high-impact near-freezing winter precipitation events. For instance, climatologies show that this area encompasses one of the two largest local maxima in occurrence of freezing rain over continental North America. Additionally, it possesses diverse terrain features (e.g., the St. Lawrence River, Lake Champlain, and Ottawa River Valleys) that will allow us to investigate the influence of orography on the mesoscale circulations that affect local precipitation types.

The focus region will also allow WINTRE-MIX to leverage state-of-the-art operational surface mesonet and radar observations. These include data from the already-operational New York State Mesonet operated by UAlbany. This network consists of dozens of standard weather stations in the study region, augmented by supersites at which full surface energy budget observations are made. Doppler lidar and microwave radiometer profiles are also available at several sites. Additionally, the Québec Climate Sentinel network (operated by UQAM and McGill) includes surface meteorological stations, profiling precipitation radars (Micro Rain Radars), ceilometers, optical
disdrometers (Parsivel2), and icing detectors. We will also use dual-polarization radar data from the operational networks in the U.S. (e.g., Burlington, Vermont, and Montague, New York) and Canada (e.g., Blainville and Villeroy, Québec).

From the LAOF Program, we will request the UWKA with a suite of in-situ probes to collect detailed measurements of mesoscale variations in thermodynamic conditions, winds, and microphysical properties during near-freezing precipitation events. Aboard the UWKA, we also will request the Wyoming Cloud Radar (WCR) and Wyoming Cloud Lidar (WCL) to better connect the detailed in situ measurements to broader atmospheric and cloud/precipitation conditions. We will also request mobile radars from the Center for Severe Weather Research (CSWR) to characterize mesoscale variability in precipitation type, precipitation intensity, and boundary layer winds. Specifically, we plan to request two dual-polarization X-band Doppler on Wheels (DOW) radars and the C-band on Wheels (COW) radar. We also plan to request a CSWR Mobile Mesonet truck to allow for targeted observations of surface conditions.

To complement the operational mesonets, radar networks, and LAOF facilities, we also plan to deploy a variety of PI-supplied instrumentation, likely to include: two X-band profiling radars (McGill), K-band profiling Micro Rain Radars (CU, UAlbany, McGill), Parsivel2 optical disdrometers (CU, UAlbany, UQAM), balloon sounding systems (McGill, CU, UAlbany), profiling microwave radiometers and lidars (UAlbany, CU), as well as hydrometeor photography and a mobile weather station (UQAM). Two fixed scanning Doppler lidars will be operational in downtown Montreal as well as a mobile system nearby (UQAM/McGill).

Our current plan is to conduct field operations from about 15 January to 28 February 2022. However, we have some flexibility on timing and could potentially shift this time frame by about 2 weeks without compromising our ability to meet the project objectives.

We thank you for your consideration and look forward to sharing more details with you in the upcoming months. Please feel free to contact me with any questions.

Best regards,

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Cc: Jeffrey French, Katja Friedrich, Andrew Winters, Nick Bassill, Chungu Lu, Jielun Sun, Nicholas Anderson, Ming Cai