# Weekly Report – April 12, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

Submitted by: Debra Baker & Maureen Cribb
Email: drb@umd.edu
Phone: 301-405-5397

Date of Submission: 12 April 2024

## PUBLICATIONS

**An Improved Radar for Making More Accurate Snow-Related Measurements**

Citation: **Kolpuke**, **Shriniwas**, **Feras Abushakra**, **S. Prasad Gogineni**, David Braaten, **Drew Taylor**, **Jordan Larson**, **Allain Rapadas**, **Tuan Luong**, 2024: Airborne multichannel UWB FMCW radar for snow depth measurements. IEEE Trans. Geosci. Remote Sens. 62, 2008115, https://doi.org/10.1109/TGRS.2024.3359125.
(CISESS Consortium Members from The University of Alabama, Tuscaloosa AL, in bold)

Summary: More than a sixth of the world's population depends on the fresh water supply from mountain glaciers and snowpacks. However, the retreat of mountain glaciers and the reduction of snowpacks threaten this important source of fresh water. Measuring snow characteristics, such as snow depth, among others, is thus important. Airborne frequency-modulated continuous-wave (FMCW) radars are a tool for measuring such things, bridging the gap between coarse-resolution satellite data obtained over a large scale and point-scale in-situ data.

CISESS Consortium Members from the University of Alabama and co-author have successfully designed, developed, and deployed a low-power, high-sensitivity airborne multichannel FMCW radar for snow-depth measurements. Data collected from a field campaign in Colorado in January and February of 2023 using this improved radar system, which included a new correction mechanism for roll and pitch movements of the aircraft, agreed well with in-situ measurements. Of note was the capability of generating useable data products within a few hours of a survey flight.

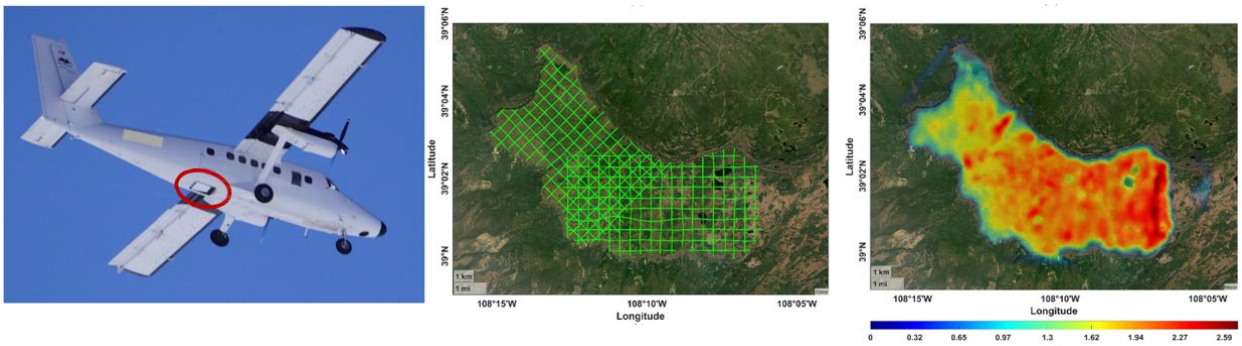

***Figure:*** *Area snow coverage. (left) DHC-6 Twin Otter aircraft during survey flights. (center) Survey flight grid. (right) Area snow depth map in meters.*

*(Prasad Gogineni, CISESS & UA-T, pgogineni@ua.edu; Funding: NWC)*

**Getting a Handle on North Korean Carbon Monoxide Emissions**

Citation: Kim, Eunhye, Byeong-Uk Kim, **Hyun Cheol Kim**, Yang Liu, Yoon Hee Kang, Daniel J. Jacob, Yong Pyo Kim, Jung-Hun Woo, Jhoon Kim, Shuxiao Wang, Chul Yoo, Changhan Bae, Younha Kim, and Soontae Kim, 2024: North Korean CO emissions reconstruction using DMZ ground observations, TROPOMI space-borne data, and the CMAQ air quality model. Sci. Total Environ. 921, 171059, https://doi.org/10.1016/j.scitotenv.2024.171059.

Summary: Although known to be high and harmful to the population, emissions of pollutants in North Korea have not yet been quantitatively assessed. This is problematic because air pollutants like carbon monoxide know no boundaries, making the development of air pollution management plans in that country and neighboring countries difficult. It is thus essential to use realistic emissions from North Korea for air quality research in Northeast Asia.

Using ground observations from monitoring stations near the demilitarized zone in the vicinity of North Korea and satellite-retrieved vertical column densities from the TROPOspheric Monitoring Instrument, combined with Community Multi-Scale Air Quality chemistry transport model simulations, CISESS Scientist Hyun Cheol Kim and co-authors developed a novel approach to generate an updated inventory of North Korean carbon monoxide emissions, based on an existing emissions inventory. This involved adjusting the emission intensity and the spatial distribution of emissions. They demonstrated that ground-based and satellite observations, integrated with air quality simulations, can be used to improve the emissions inventory in areas where air quality data are limited.

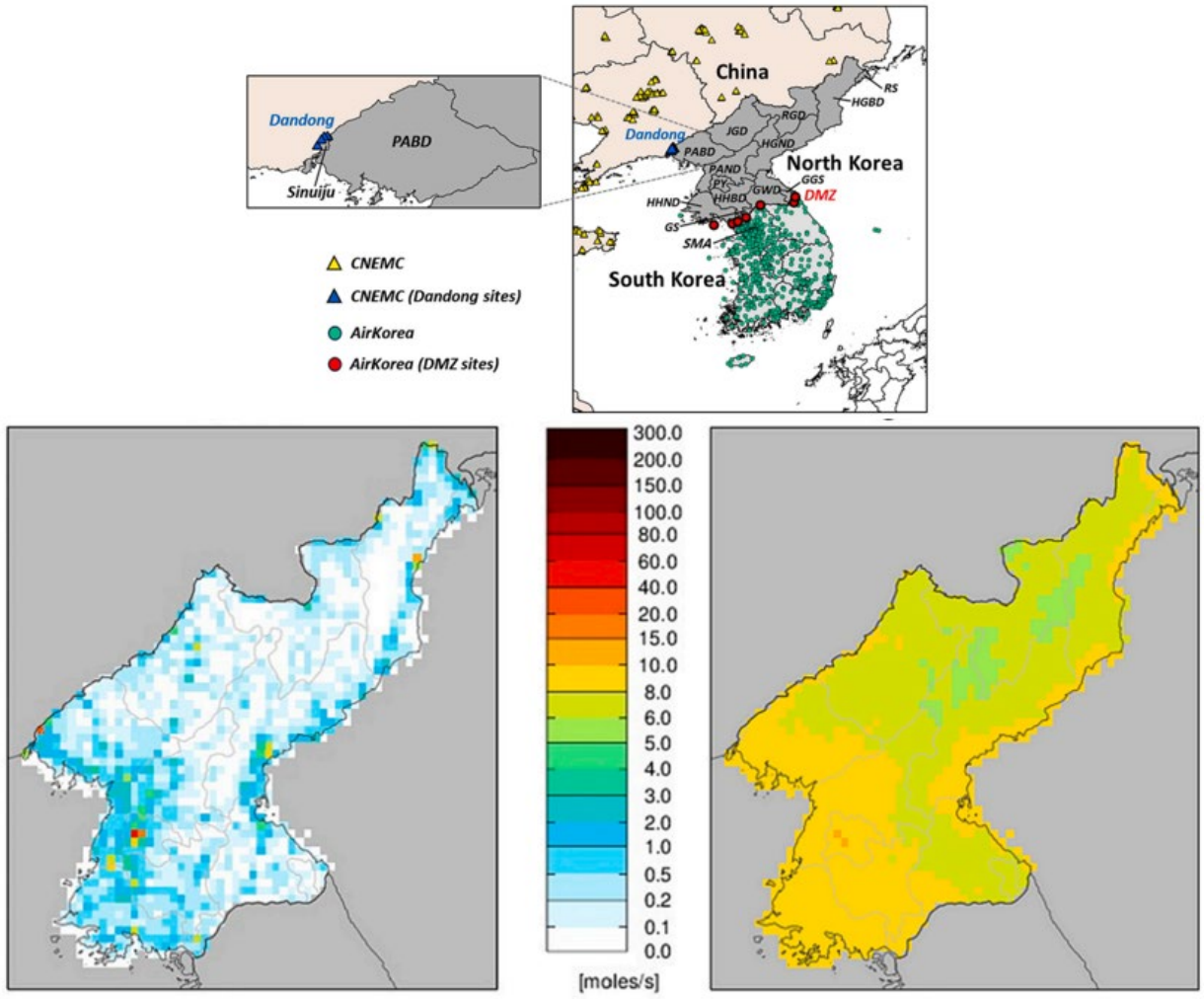


***Figure:*** *(Adapted from the article). (top) Area of interest. Dots and triangles show the locations of different ground monitoring stations. (bottom) Spatial distributions of CO emissions in North Korea during the period of December 2020 to March 2021: (left) Using the existing emissions inventory and (right) using the updated emissions inventory.*

*(Hyun Cheol Kim, CISESS, hyun.kim@noaa.gov, Funding: ARL)*

*(Maureen Cribb, CISESS, mcribb@umd.edu, Funding: Task I)*