NCAR | NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Cold-Air outbreak Experiment in the Sub-Arctic Region (CAESAR)

The CAESAR project seeks to make observations of outbreaks of cold Arctic air over the warmer ocean in the North Atlantic using the National Science Foundation / National Center for Atmospheric Research (NSF/NCAR) C-130 research aircraft. The C-130 will fly over the far northern Atlantic Ocean in order to document these cold-air outbreaks over open water using a payload of scientific instrumentation taking a wide variety of atmospheric measurements. Coldair outbreaks profoundly impact global atmospheric and ocean circulations. Their cloud regimes are poorly sampled and are The NSF/NCAR C-130 not well captured by computer models of the



atmosphere. CAESAR will gather observations essential to understanding the relevant processes and will apply them to guide a wide range of forecast models, which will improve forecasts for this region. Professors and students from the University of Oslo and University of Stockholm will participate in this project, which will help further their research into these processes and train the next generation of scientists. Forecasters at MET Norway will also be providing weather forecasts for the project and will have a strong interest in the results to improve their predictions.

The field campaign operational period is 22 February - 7 April 2024. The C-130 will arrive a few days before flight operations and leave shortly after the end of the campaign. 18-20 research flights are planned during this time.

Logistics

CAESAR will be based in Kiruna, Sweden, at the Arena Arctica facility. This hangar is large enough to house the C-130 along with its support equipment and has been used by airborne atmospheric other research organizations for similar programs. A team of 40 – 50 people will be on site for the duration of the campaign and will consist of flight operations and aircraft support staff along with instrumentation and science teams. Housing, transportation, consumables, and other needs for project operations will be arranged by NCAR with assistance from our local host in Kiruna and the Swedish scientific collaborators.



Area of interest for research flights during CAESAR

The C-130 will contain a large suite of instrumentation to perform the scientific research. These instruments include:

- Sensors for flight-level measurements of temperature, pressure, humidity, and wind
- Probes for measuring aerosol, cloud, and precipitation particle sizes and shapes
- Radar and lidar systems for observing cloud and aerosol layers
- Dropsondes to be released over the ocean to provide vertical measurements of temperature, humidity, and wind from the aircraft to the surface
- Sensors to measure atmospheric constituents such as ozone, carbon monoxide, and water vapor

A project of this size also requires that support equipment is shipped to the field site. This includes ground support equipment for the C-130 along with instrumentation spares, tools, consumables, and other miscellaneous items. Most is sent ahead of the project in large containers, while other last-minute items are generally shipped using standard carriers. NCAR has a logistics and shipping department to help make these arrangements. All equipment, with the exception of the expendable dropsondes, will be taken back to the US.

The permissions required to operate the C-130 for research in airspace controlled by Norway, Sweden, Iceland, and Greenland (Denmark) will be requested through diplomatic channels. This request will be coordinated closely with NSF and the State Department, and work will begin on that early. Flights will **not** be planned for or enter Russian airspace, and will remain west of **24**° **E** longitude or within the boundaries provided at the time of the project based on the status of the conflict in Ukraine.

The CAESAR campaign includes education and outreach activities including scientific talks, aircraft tours, and press releases to raise awareness of the scientific mission in the local community and beyond. The scientists and C-130 crew enjoy talking to the public, and there are plans to organize and support outreach events while on site.

COVID-19

While many parts of life have returned to normal after the worldwide outbreak of the SARS-CoV-2 coronavirus, the CAESAR team also understand that we must remain as flexible as possible while making arrangements for field campaigns. Requirements imposed by the continued spread of the virus may impact operations, and the CAESAR team will remain alert and ready to respond to any changes in policies or procedures prior to the project.

Organization

The National Center for Atmospheric Research, located in Boulder, Colorado, USA is a worldclass research center leading, promoting, and facilitating innovation in the atmospheric and related Earth and Sun systems sciences. NCAR is sponsored by the National Science Foundation. To learn more visit <u>https://ncar.ucar.edu/</u>.

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