Physics and Physical Oceanography Seminar

Wednesday, January 22, 2020
C2045 1:00 – 2:00 pm

Lidar in the Canadian High Arctic

Emily McCullough (Atmospheric Science, Dalhousie)

Abstract:
Clouds influence Earth's radiation budget and therefore global climate. However, there remains large uncertainty in the net effect of clouds on the climate, especially in the Arctic, which is warming twice as quickly as other areas. An individual cloud can either warm or cool the atmosphere, depending on its size and composition. Accurately measuring cloud properties is challenging, particularly in the Arctic where there are few research stations and much of the year is dark and extremely cold.

Lidar is an excellent tool for studying Arctic clouds. The CANDAC Rayleigh-Mie-Raman lidar (CRL) is located at Eureka, Nunavut (80° N, 86° W) in Canada's High Arctic. With two lasers and a 1-m telescope, the remotely-operable lidar makes vertical profiles of the atmosphere with 7.5 m resolution every 1 minute, 24 h/day. Its measurements allow liquid droplets to be discerned from frozen particles, even during the darkness of polar night. Co-located instruments at the Polar Environment Atmospheric Research Laboratory (PEARL) make for a data set which is well-supported for intercomparison analyses.

Most recently, I have been using CRL to study mixed-phase clouds, which have a mixture of liquid and ice particles. Using the highest resolution CRL data, I have detected thin laminations within these clouds. These laminations are well-correlated with snowing conditions at Eureka, and have implications for the way in which the Arctic clouds are influencing the local radiation budget and the global climate.

I will present the scientific results from CRL and Eureka, and discuss the practical side of doing high-quality research at a remote Arctic research station.

Speaker:
Dr. Emily McCullough is an atmospheric lidar scientist working in the Department of Physics and Atmospheric Science at Dalhousie University.

She lives in St. John's and works remotely to run the Canadian Network for the Detection of Atmospheric Change (CANDAC) Rayleigh-Mie-Raman lidar at Eureka, Nunavut on Ellesmere Island, making trips to the lab several times per year as needed.