## Vita

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Universities Attended:

University of New Brunswick (2017)
Bachelors of Science
Physics

University of New Brunswick (2024)
Masters of Science
Physics

**Conferences Presentations/Publications:**

"Identifying Gravity Waves with Periods Greater than Two Hours Using an All- Sky Airglow Imager Located in Eureka, Nunavut." (2017). Bachelor's, University of New Brunswick, Fredericton, Canada, April 2017.

"The Importance and Restoration of Urban Waterways." Canadian Parks and Wilderness Society (CPAWS) Stewardship Program Summit, Ottawa, Ontario, Canada, February 2020.

"Polar airglow trends derived from the PEARL All-Sky Imager (PASI) observations in Eureka, Nunavut." Canadian Meteorological and Oceanographic Society (CMOS), Online, June 2020.

"PASI: Qualifying Nightglow Data and Preliminary Trends." Canadian Network for the Detection of Atmospheric Change (CANDAC) Workshop, Online, Summer 2020.

"Airglow Climatology in the Canadian High Arctic." "International Union of Geodesy and Geophysics" (IUGG), Montreal, Quebec, Canada, July 2019.

# Long-Term Trends in Optical Airglow Observations in the Canadian High Arctic

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

**Dustin G. Gamblin**

in the Department of Physics

U.N.B., Fredericton, N.B.

**Tuesday, June 11th, 2024**
**11:00 a.m.**

Physics Building, Room P204

Examining Committee

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|---|---|
| Dr. William Ward | Supervisor |
| Dr. Bruce Balcom | Internal Examiner |
| Dr. Adam Dyker | External Examiner |
| Dr. Dennis Tokaryk | Chair of Oral Examination |

## Abstract

The PEARL All-Sky Imager (PASI) is an optical atmospheric imager, installed at Eureka, Nunavut, Canada (80N, 86W) in August 2007, as part of the Canadian Network for the Detection of Atmospheric Change (CANDAC). PASI is capable of imaging the following airglow emissions: sodium doublet (589.3nm), oxygen green line (557.7nm), oxygen redline (630.0nm), hydroxyl in the near-IR, and N2 first negative group (0,1) band. Previously PASI has been used to detect gravity waves (1). The work associated with this thesis includes the development of a systematic calibration routine and the corresponding calibrated images, the development of a long-term airglow trend analysis routine, the comparison between derived seasonal, diurnal, and solar cycle-scale night glow trends, and the corresponding "midnight" airglow case. While the presence of diurnal variability is unconvincing, seasonal variability is present and analogous to midlatitude variations, and unaffected by the solar elevation variability during nighttime observations. Of particular interest is the influence of the solar sunspot cycle on airglow brightness: a large decrease in the sunspot number in the 2012-2013 season corresponds to a decrease in the Sodium and Oxygen Greenline emissions in the Canadian high arctic. As the study location is unaffected by direct solar radiation in the winter months, this provides further evidence for the circulation of middle atmospheric constituents, along with an estimate for the lag between solar variation, and airglow chemistry variations.