Ph.D. Candidate

Samuel Kaare Kristoffersen

Graduate Academic Unit

Physics

October 15, 2019

3:00 p.m.

Forestry/Geology Bldg.

Room 202

Examing Board:

Dr. Dennis Tokaryk (Physics)
Dr. Jayachandran Thayyil (Physics)
Dr. Yun Zhang (Geodesy & Geomatics Eng.)
Dr. William Ward (Physics) Supervisor

External Examiner:

Dr. Jonathan Snively
Dept. of Physical Sciences
Embry-Riddle Aeronautical University
Daytona Beach, FL

The Oral Examination will be chaired by:

Dr. Kevin Englehart, Associate Dean of Graduate Studies

BIOGRAHY

Universities attended (with dates & degrees obtained):

2012 – present
PhD candidate, University of New Brunswick
2008 – 2012
MSc in Physics, University of New Brunswick
2004 – 2008
BSc in Physics (Honours), University of New Brunswick

Publications:


Conference Presentations:


Several Other Conference Presentations
Doppler Michelson Interferometer Wind Observations and Interpretations

Abstract

The study of gravity waves is important for a complete understanding of the atmosphere as a whole, including the effects on large scale circulation patterns. Doppler shifts in the atmospheric airglow emissions (namely green line, O₂, and OH) are measured using Michelson interferometers to determine winds in the mesosphere at heights between about 87 and 97 km. The research of this thesis is sub-divided into two sections, one of the in lab testing of a novel monolithic Doppler Michelson interferometer design, and the second of wind and gravity wave observations in the polar mesosphere.

The first part of this research involves the in-lab testing of a multi-segmented mirror Michelson interferometer known as the WaMI, designed as a monolithic wind imaging Doppler Michelson interferometer. This testing includes determination of the relative path differences of the four mirror segments and Doppler imaging of a retro-reflective rotating wheel. This acts as a proof of concept for this monolithic design, which was initially conceived for a satellite limb measurements of winds and rotational temperature measurements.

The wind and gravity wave observations are made with the E-Region Wind Interferometer (ERWIN-II) a Doppler Michelson interferometer located at the Polar Environment Atmospheric Research Laboratory (PEARL) in Eureka, Nu. (80 N, 86 W) since 2008. Observations of gravity waves in the winds and airglow brightness have allowed for the determination of the frequency and wave vectors of these gravity waves, in addition to demonstrating the vertical motion of the airglow layers by correlating the brightness with the vertical winds. Additional airglow height information was determined using correlations with a meteor radar co-located at PEARL. Observations of quasi-tidal frequency (between about 8 and 12 hour period) waves suggest that these waves may be inertia-gravity waves and not tides, with additional support provided by the enhancement of the gravity wave spectra at the inertial (Coriolis) frequency.

UNIVERSITY OF NEW BRUNSWICK

SCHOOL OF GRADUATE STUDIES

ORAL EXAMINATION

Samuel Kristoffersen

IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY