University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Master of Science

of

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"A Fog and Low Visibility Climatology for Selected Stations in the Western Canadian Arctic"

Department of Geography

Wednesday, November 30, 2016
10:30AM
University Centre Building
Room A207a

Supervisory Committee:
Dr. David Atkinson, Department of Geography, University of Victoria (Supervisor)
Dr. Faron Anslow, Pacific Climate Impacts Consortium , UVic (Member)

External Examiner:
Dr. Maycira Costa, Department of Geography, UVic

Chair of Oral Examination:
Dr. Christopher Nelson, Department of Biochemistry & Microbiology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

A detailed examination of low visibility (LV) occurrences and the weather types that cause low visibility, with a focus on fog, was performed for five weather stations in the western Canadian Arctic, in the vicinity of the Amundsen Gulf area of the eastern Beaufort Sea. A series of climatologies were developed that established patterns of LV occurrence as a proportion of all observations and as a function of LV events caused by fog. Frequency climatologies for other weather types were also performed; in particular, for snow, blowing snow, rain, and drizzle. Annual climatologies were used to assess possible trends in the 1980-2015 period of study. Monthlies were used to identify typical patterns of occurrence over the course of a year, and hourlies over the course of a day. A dataset of multi-hour fog events was also created; some of these were related to synoptic patterns. Analysis was also broken down by season.

Results indicate several things. Trends in the occurrence of LV or fog events were not discernible over the timeframe of the study (1980-2015) at any of the five study sites.

Monthly climatologies showed considerable diversity across the study area. Three distinct groupings were noted: Tuktoyaktuk and Ulukhaktok with a maximum frequency of LV conditions in February, Aklavik and Inuvik with a maxiumum frequency in October, and Sachs Harbour in August. The February maximum in Tuktoyaktuk and Ulukhaktok was related to cold air temperatures combined with small amounts of moisture from sea ice leads. The Alkavik and Inuvik October maximum was related to moisture advected over land from remaining open water, as well as diurnal snow melt adding moisture to the boundary layer that condenses as the evening cools off. The August maximum in Sachs Harbour is a reflection of proximity to open water and cold air temperatures.

Hourly climatologies in the spring/fall season showed most stations have maximum occurrence of LV events caused by fog in the early morning. This is a radiative effect; cooling overnight causes radiation fog that peaks in occurrence just as morning begins. This peak is pushed into the midday in the winter, and is much weaker in the summer, both reflections of the changing pattern of daylight hours.