Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

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MSc (Universidad Nacional Autonoma de Mexico, 1988)
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“Slush-ice Berms on the West Coast of Alaska: Development of a Conceptual Model of Formation Based on Input from and Work with Local Observers in Shaktoolik, Gambell and Shishmaref, Alaska”

Department of Geography

Friday, January 6, 2017
10:30AM
David Turpin Building
Room B215

Supervisory Committee:
Dr. David Atkinson, Department of Geography, University of Victoria (Supervisor)
Dr. Johannes Feddema, Department of Geography, UVic (Member)
Dr. Henry Huntington, Pew Charitable Trusts (Outside Member)

External Examiner:
Dr. Olivia Lee, International Artic Research Centre, University of Alaska

Chair of Oral Examination:
Dr. Chris Upton, Department of Biochemistry & Microbiology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Bering Sea storms regularly bring adverse environmental conditions, including large waves and storm surges of up to 4 m, to the west coast of Alaska. These conditions can cause flooding, erosion and other damage that affects marine subsistence activities and infrastructure in the low-lying coastal communities. Storm impacts also include interactions with sea ice in various states: large floes, shore-fast ice, the acceleration of sea-ice formation in frazil or slush state, and the formation of slush-ice berms. Slush-ice berms are accumulations of slush ice that develop under the right wind, water level, and air temperature, and snow conditions. During a strong wind event, large amounts of slush may be formed and pushed onto the shore, where the slush can accumulate, solidify and protect communities from flooding and erosion. Slush ice berms can also be problematic, restricting access to the coast and presenting other hazards. Residents of Shishmaref and Shaktoolik, communities on the west coast of Alaska, observed the formation of slush-ice berms during storms that occurred in 2007, 2009 and 2011. These formations are important to the communities, and it would be useful to develop the capacity to predict their occurrence. However, scientific work has not been conducted on this phenomenon, with the result that a physical conceptual model describing the formation of slush-ice berms does not exist. In recognition of this need, a project thesis was designed, and had as its main objective to identify and document the environmental and synoptic weather conditions that lead to these types of events, and to develop a descriptive physical conceptual model of slush-ice berm formation. A key to this work was the engagement of traditional knowledge holders and local observers to gather data and information about slush ice and slush-ice berm formation, along with the specific dates when these events took place. This dissertation is organized around three major elements: development of a conceptual model of slush-ice berm formation; presenting the traditional knowledge gathered that led to the development of this model; and documenting the methods and tools used to engage traditional knowledge holders and local observers in this process. In this dissertation, the knowledge from traditional knowledge holders on slush ice formation is presented in the context of feeding into a physical scientific process – specifically, developing a descriptive physical conceptual model of slush-ice berm formation. It is expected that this type of research will contribute to slush-ice berm forecasting which would aid communities’ safety by improving assessment of environmental risk.