



University  
of Victoria

Graduate Studies

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

of

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Laurea (University of Bologna, 2016)

**“New Radiometric Age Constraints on the Ordovician-Silurian  
Boundary from Anticosti Island (Eastern Canada)  
and the Siljan District (Sweden)”**

School of Earth and Ocean Sciences

Tuesday August 6, 2019

9:30 A.M.

Bob Wright Centre

Room A319

Supervisory Committee:

Dr. Jon Husson, School of Earth and Ocean Sciences, University of Victoria (Supervisor)

Dr. Dante Canil, School of Earth and Ocean Sciences, UVic (Member)

Dr. Vera Pospelova, School of Earth and Ocean Sciences, UVic (Member)

External Examiner:

Dr. Shahin Dashtgard, Earth and Ocean Sciences, Simon Fraser University

Chair of Oral Examination:

Dr. Elizabeth Adjin-Tettey, Faculty of Law, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

## Abstract

The transition from the end of the Ordovician to the beginning of the Silurian Period is characterized by the glaciation of the Gondwana paleocontinent, eustatic sea level change, a perturbation to the global carbon cycle and one of the five major mass extinctions of the Phanerozoic Eon. Due to the significant sea level fall, the Ordovician-Silurian (O-S) boundary is often marked by hiatus and exposure in the shallow marine geologic record. More complete stratigraphic successions are found in comparatively deeper localities, such as the Anticosti Basin of Quebec (Canada), and the carbonate mounds of the Siljan ring district (Dalarna County, Sweden).

The exact timing and dynamics of the glaciation and mass extinction are yet to be understood. Similarly, the interplay between those events and the carbon cycle perturbation are still unclear. As a result, there is a serious need for radiometric ages in this crucial part of the Paleozoic Era. The acquisition of more radiometric dates, achieved in this study, aims to address the present dearth of absolute dates close to the boundary. The dates produced in this study allow to better constrain the O-S boundary, especially considering the development of the EARTHTIME initiative and modern U-Pb dating techniques that have improved accuracy and allowed for dating of single zircon crystals at  $\leq 0.1\%$  precision level.

Here we present two new volcanic ashfalls ages. The first ash,  $443.61 \pm 0.52$  Ma ( $2\sigma$ , including analytical, tracer calibration and decay constant uncertainties) was collected from the base of the Lousy Cove Member, Ellis Bay Formation (Anticosti Island, Quebec, Canada). The second one,  $443.28 \pm 0.50$  Ma (including analytical, tracer calibration and decay constant uncertainties) comes from a karstic void within the Boda Core Facies of the Boda Formation (Dalarna County, Sweden). U-Pb geochronology (chemical abrasion, isotope dilution, thermal ionization mass spectrometry: CA-ID-TIMS) on single zircons was used to obtain these ages.

These results are the closest radiometric ages to the O-S boundary (compared to any time constraints in the 2012 Geologic Time Scale). These absolute ages allow one to go beyond the refinement of the current age boundary and to think about drivers of Earth system change, such as the global carbon cycle perturbation.