EGU22-1343
https://doi.org/10.5194/egusphere-egu22-1343
EGU General Assembly 2022

Resolving the Influence of Ice Stream Instability on Postglacial Relative Sea-Level Histories: the case of the St Lawrence River Channel Ice Stream

Richard Peltier[1], **Tanghua Li**[2], Gordan Stuhnne[1], Jesse Velay-Vitow[1], Matteo Vacchi[3], Simon Englehart[4], and Benjamin Horton[2,5]

[1]University of Toronto, Centre for Global Change Science, Physics, Toronto, Canada (peltier@atmosp.physics.utoronto.ca)
[2]Earth Observatory of Singapore, Nanyang Technological University, Singapore
[3]Department of Earth Sciences, University of Pisa, Italy
[4]Department of Geography, Durham University, UK
[5]Asian School of the Environment, Nanyang Technological University, Singapore

A challenge to understanding Late Quaternary glaciation history is the mechanism(s) responsible for the asymmetry in an individual glaciation cycle between the slow pace of glaciation and the more rapid pace of deglaciation (e.g., Broecker and Van Donk, 1970). It is increasingly clear that a major contributor to the rate of global deglaciation is the instability of marine terminating ice streams. Recent analyses by Velay-Vitow et al. (2020) suggest that these instabilities were often triggered by ocean tides of anomalously high amplitude. Examples include the Hudson Strait Ice Stream responsible for Heinrich Event 1 (H1) and the Amundsen Gulf Ice Stream. Here, we analyse the instability of the Laurentian Channel and St Lawrence River Channel ice stream system. Our analysis begins with the recognition of highly significant misfits of up to 60 m at ~9,000 calendar years ago between deglacial relative sea-level histories inferred by Vacchi et al. (2018) at sites along the St Lawrence River Channel and those predicted by the ICE-6G_C (VM5a) and ICE-7G_NA (VM7) models of the Glacial Isostatic Adjustment process. We suggest that these disagreements between models and data may be due to the St Lawrence River Channel ice stream becoming unstable during the deglaciation of the Laurentide Ice Sheet (LIS) due to the hypothesized tidal mechanism for ice stream destabilization. We investigate a sequence of scenarios designed to provide a best estimate of the timing of this event. Since this ice stream penetrated deeply into the interior of the LIS and was connected to the Laurentian Channel ice stream, the instability of the latter was required in order for destabilization of the St Lawrence River channel ice stream to be possible. We explore the consistency of the implied sequence of events with the observational constraints.