Geophysical Research Abstracts
Vol. 16, EGU2014-9669, 2014
EGU General Assembly 2014

Ice streams in the Laurentide Ice Sheet: a new mapping inventory

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Rapidly-flowing ice streams dominate the drainage of continental ice sheets and are a key component of their mass balance. Due to their potential impact on sea level, their activity in the Antarctic and Greenland Ice Sheets has undergone detailed scrutiny in recent decades. However, these observations only cover a fraction of their 'life-span' and the subglacial processes that facilitate their rapid flow are very difficult to observe. To circumvent these problems, numerous workers have highlighted the potential of investigating palaeo-ice streams tracks, preserved in the landform and sedimentary record of former ice sheets. As such, it is becoming increasingly important to know where and when palaeo-ice streams operated. We present a new examination of ice streams in the North American Laurentide Ice Sheet (LIS), which was the largest of the ephemeral Pleistocene ice sheets and where numerous ice streams have been hypothesised. We compile previously-published evidence of ice stream activity and complement it with new mapping to generate the most complete and consistent inventory to date. Our map identifies close to three times as many ice streams (117 in total) compared to previous inventories, and categorises them according to the evidence they left behind, with some locations more speculative than others. We note that LIS ice streams span a broad range of size and shapes. The majority of large ice streams, thought to have operated during the Last Glacial Maximum, are comparable in size and shape to modern Antarctic ice streams, but we note a group of ice streams with low length-to-width ratios that do not have modern-day analogues and might be unique to deglacial conditions in which they operated. This study of Laurentide ice streams considerably refines our understanding of LIS dynamics, but there is a clear requirement for improved dating of ice stream activity.