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Large-scale integrated subglacial drainage around the former Keewatin Ice Divide, Canada reveals interaction between distributed and channelised systems

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Despite being widely studied, subglacial meltwater landforms are typically mapped and investigated individually, thus the drainage system as a whole remains poorly understood. Here, we identify and map all visible traces of subglacial meltwater flow across the Keewatin sector of the former Laurentide Ice Sheet from the ArcticDEM, generating significant new insights into the connectedness of the drainage system.

Due to similarities in spacing, morphometry and spatial location, we suggest that the 100s-1000s m wide features often flanking and connecting sections of eskers (i.e. tunnel valleys, meltwater tracks and esker splays) are varying expressions of the same phenomena and collectively term these features 'meltwater corridors'. Based on observations from contemporary ice masses, we propose a new formation model based on the pressure fluctuations surrounding a central conduit, in which the esker records the imprint of the central conduit and the wider meltwater corridors the interactions with the surrounding distributed drainage system, or variable pressure axis (VPA).

We suggest that the widespread aerial coverage of meltwater corridors across the Keewatin sector provides constraints on the extent of basal uncoupling induced by basal water pressure fluctuation and variations in spatial distribution and evolution of the subglacial drainage system, which have important implications for ice sheet dynamics.