Prospecting for ancient terrestrial crust using detrital zircon geochronology of late Pleistocene glacial sediments from the Acasta Gneiss Complex

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Very few outcrops of continental crust in excess of 4.0 Ga are currently known. One of the few existing relicts is the Acasta Gneiss Complex (AGC), part of a ~1300 km^2 area of basement gneisses located along the western edge of the Slave Craton in the Northwest Territories. The current extent of the AGC is poorly constrained, and much of the surrounding area is heavily under mapped due to logistical constraints concerning accessibility, terrain, and foliage. To overcome these obstacles, we sampled a late Pleistocene esker system at six locations along a ~40 km transect. The esker sediment transport direction was from east to west, and perpendicularly cross-cuts currently mapped north-south trending rock boundaries. Esker sediment was separated into discrete size fractions, and zircons were extracted from the >1mm fraction and <250 μm fraction to assess potential biases from sediment transport distance. We dated 200 zircons from each fraction (400 per sample) by U-Pb LA-ICP-MS on an ICAP quadrupole instrument. The data were screened to 5% discordance, and kernel density estimates were generated to facilitate data comparison and interpretation. Small but distinct peaks <2.0 Ga in samples directly down-ice of Wopmay orogen rocks suggest that prominent lithological shifts are recorded by the esker sediments. Large peaks at ~3.4, 3.6 and 3.8 Ga are prominent in the eastern-most sample on the transect, which is outside the assumed eastern boundary of the AGC. Given the transport direction of the esker sediments, we thus suggest that the ancient rocks of the AGC may extend further east than previously thought.