

## **Are Earth's oldest felsic rocks impact melts?**

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Earth's oldest felsic rocks, the 4.02 billion-year-old Idiwhaa gneisses of the Acasta Gneiss Complex, northwest Canada, have compositions that are distinct from the felsic rocks that typify Earth's ancient continental nuclei, implying they formed through a different process. Using phase equilibria and trace element modelling, we show that the Idiwhaa gneisses were produced by partial melting of iron-rich amphibolite host rocks at very low pressures, equating to the uppermost ~3 km of mafic crust. The heat required for such shallow melting is most easily explained through meteorite impacts. Hydrodynamic impact modelling shows that, not only is this scenario physically plausible, but the region of shallow melting appropriate to formation of the Idiwhaa gneisses would have been widespread. Given the predicted high flux of meteorites during the late Hadean, impact melting may have been the predominant mechanism that generated Hadean felsic rocks.