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PLEISTOCENE ORGANIC MATER MODIFIED BY HIAWATHA IMPACT
DATA REPOSITORY

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METHODS: RAMAN SPECTROGRAPHY

The Raman spectra were obtained with a WITec alpha300 R system and a 488-nm laser, an UHTS300 spectrometer (grating: 600 grooves/mm), a Peltier-cooled Electron Multiplying Charge Coupled Device detector and a long working-distance 50x microscope objective (n. a. = 0.35), calibrated using the Raman spectrum of a monocrystalline silicon wafer. Laser power was adjusted individually for each sample to prevent heat-induced damage. Acquisition times were 5–30 s per spectrum, with five to ten spectra combined for each spot depending on signal intensity.

DEMONSTRATION OF CLOSE ASSOCIATION BETWEEN SHOCKED QUARTZ, IMPACT GLASS AND ORGANIC MATTER

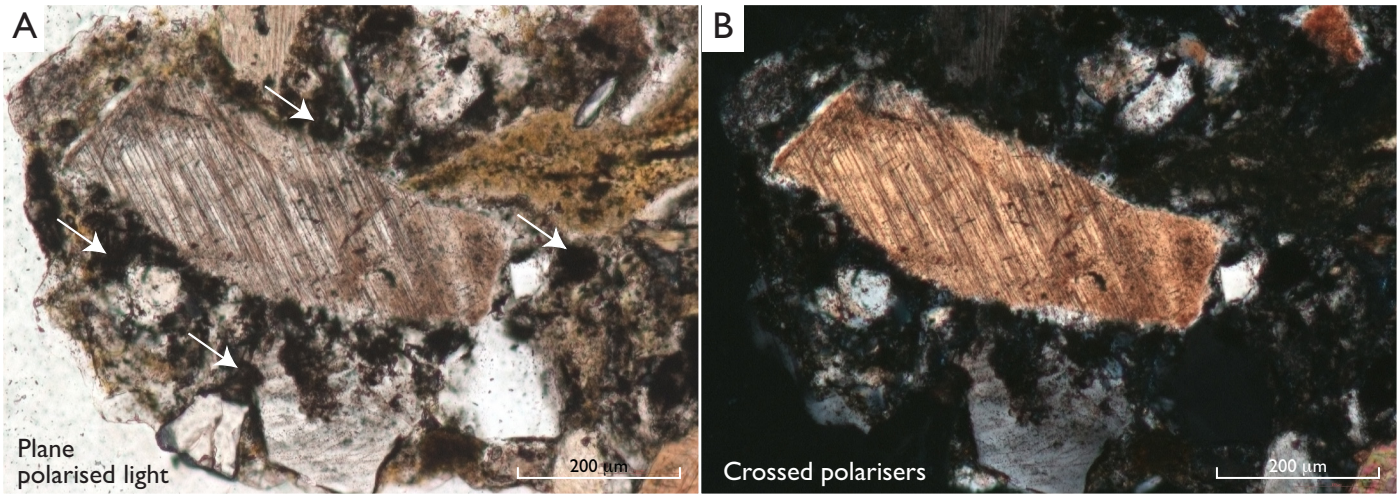


Fig. DR1. Sand-sized microbreccia grain with shocked, 'toasted' quartz and matrix rich in organic matter, concentrated in clots about 10–50 µm large (e.g. at arrows). Grain 21G-g02.

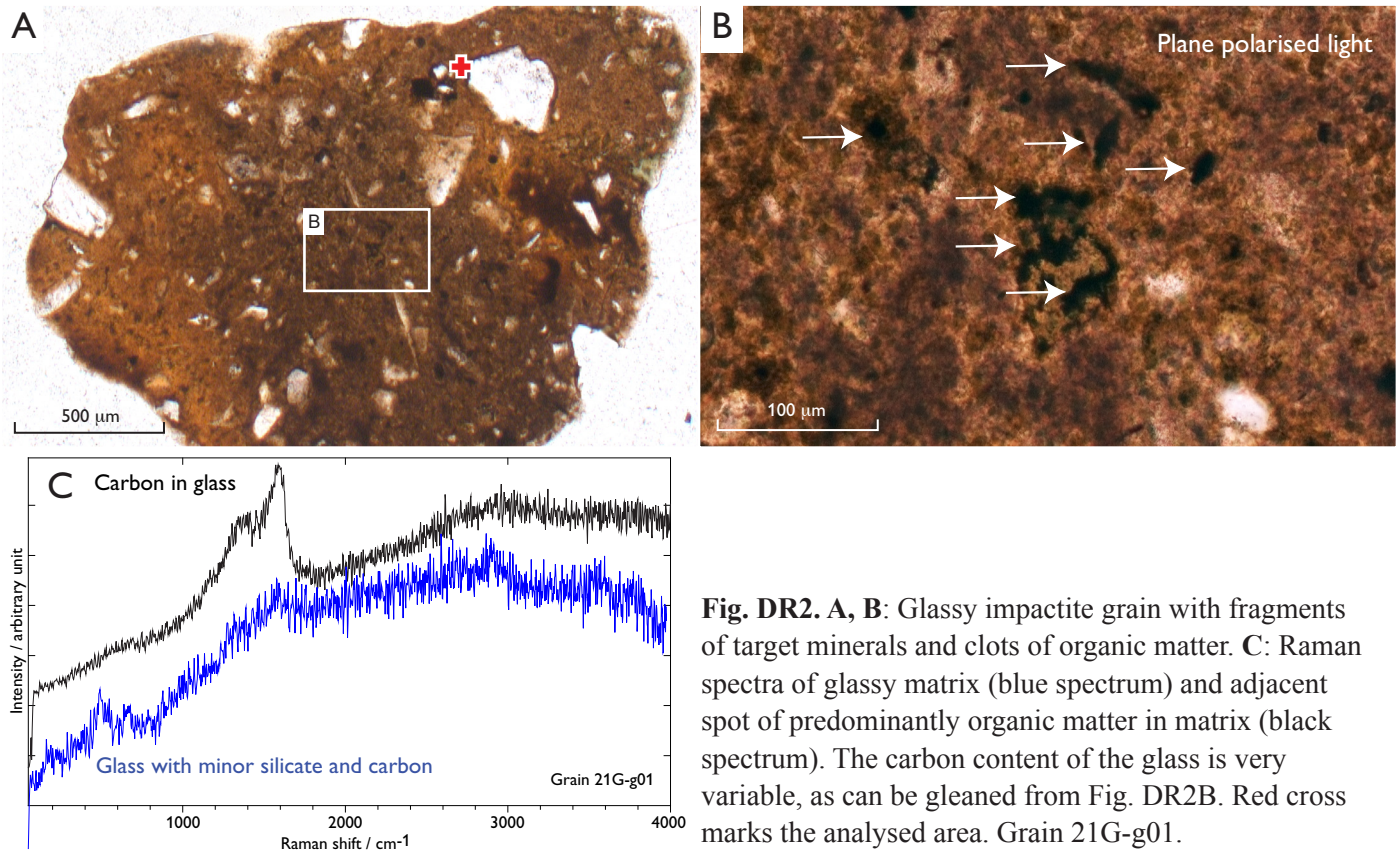


Fig. DR2. A, B: Glassy impactite grain with fragments of target minerals and clots of organic matter. **C**: Raman spectra of glassy matrix (blue spectrum) and adjacent spot of predominantly organic matter in matrix (black spectrum). The carbon content of the glass is very variable, as can be gleaned from Fig. DR2B. Red cross marks the analysed area. Grain 21G-g01.

DEMONSTRATION OF DISPERSED CARBON IN MICROBRECCIA WITH SEMI-OPAQUE GLASSY MATRIX

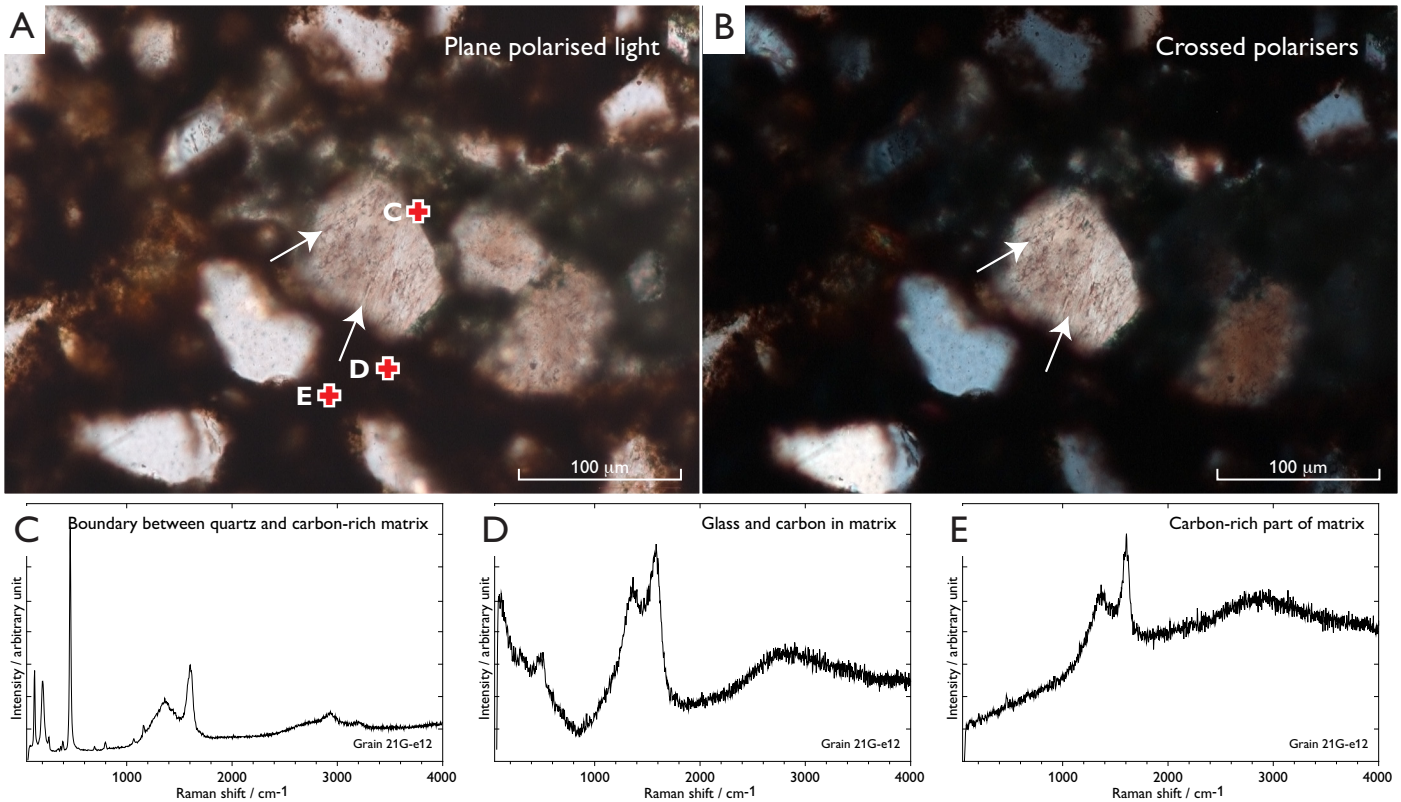


Fig. DR3. A–B: Detail of microbreccia grain with shocked quartz (arrows) and glassy matrix rich in organic matter. Raman analytical spots marked by red crosses. **C–E**: Raman spectra at boundary to shocked quartz grain (C), in glassy matrix (D) and in adjacent, carbon-dominated matrix (E). Grain 21G-e12.

RAMAN SPECTRA OF LIGNITE FRAGMENTS WITH VARIABLE REFLECTANCE

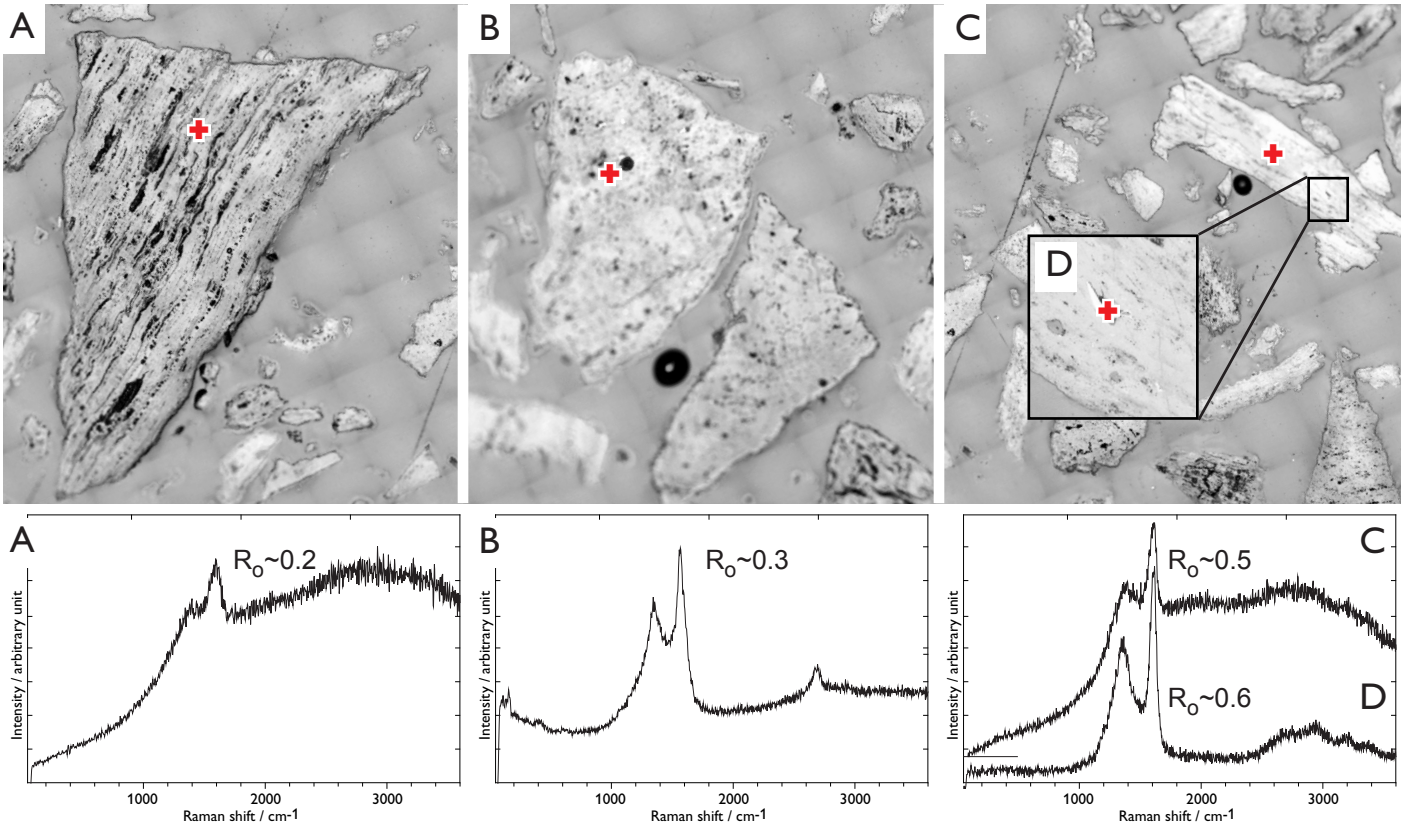
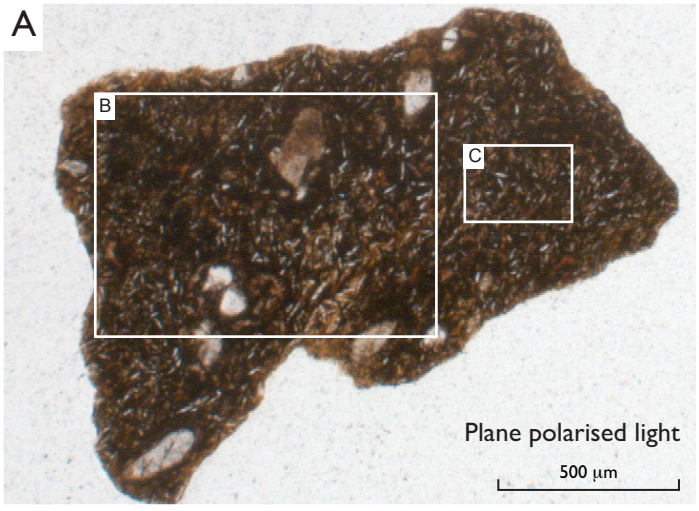


Fig. DR4 A–C. Lignite fragments arranged in order of increasing reflectance (R_o) and increasing initial Raman ordering, with positions of Raman analytical spots (red crosses). **D (inset)**: Vitrinite particle in fragment C.

DOCUMENTATION OF ORGANIC CARBON IN IMPACTITE GRAIN WITH HEMICRYSTALLINE MATRIX, USING SEM-EDS SPECTRUM



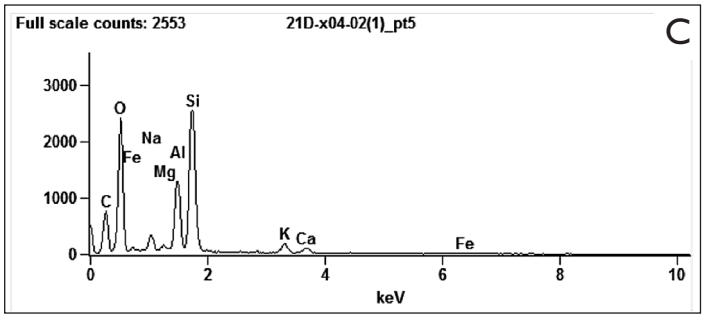
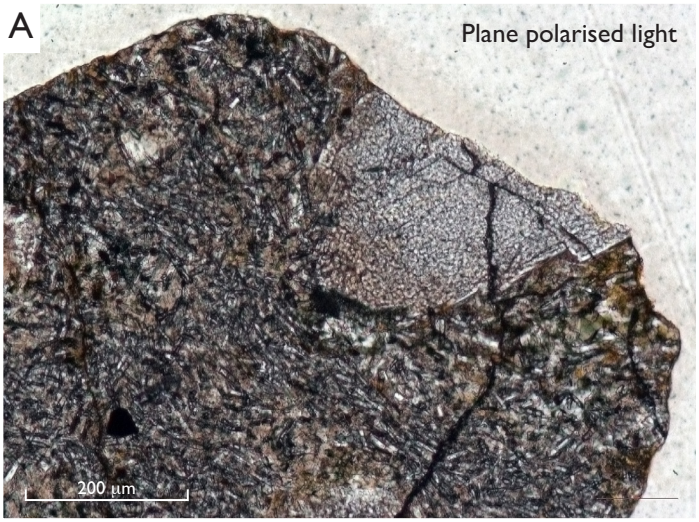


Fig. DR5. A–B: Hemicrystalline, almost opaque impactite grain with fragments of shocked, 'toasted' quartz (arrow). Groundmass with microlites of ternary feldspar and dispersed organic matter. **C**: SEM-EDS spectrum of matrix area shown in A with composition approximating ternary feldspar and a distinct carbon peak (not arising from carbon coating). Grain 21C-x04.

DEMONSTRATION OF CARBON SHEATHS AROUND FELDSPAR MICROLITES IN SHOCK-MELTED MATERIAL



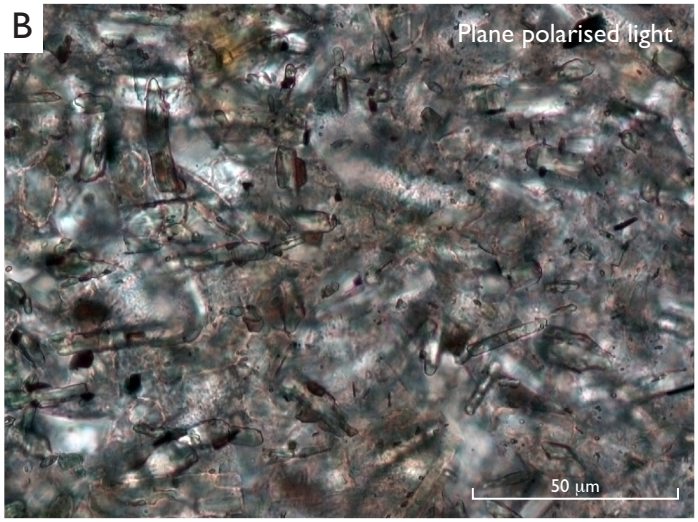


Fig. DR6. A: Microcrystalline impactite grain with small fragments of quartz and a larger fragment ~300 µm large of shocked feldspar with 'checkerboard' structure. **B**: Distinct, very thin sheaths of organic carbon on new feldspar microlites. The sheaths are most obvious where the grain margins are vertical and in focus. Grain 21D-u31.