**Supplementary Data**

**Appendix 1:** This table summarises the location, geological description and age of all of the samples described and analysed in the main article.

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| **Sample (RBH)**  | **National Grid** **Reference** | **Location**  | **Geological Description**  | **RCS code**  | **Age** |
| **Edale Basin:**  |
| 1064 | SK 10255 85186 | Stream bank south of Upper Booth, Edale | Dark fissile mudstone with large squashed ironstone bullions. | MDFEST | E2a2 |
| 1065 | SK 10255 85186 | Stream bank south of Upper Booth, Edale | Very thin bedded mudstone, calcareous, dark grey with sharp base. Lenticular calcareous zones. Small goniatite.  | SHMDM | E2a2 |
| 1066 (\*) | SK 10271 85217 | Stream bank south of Upper Booth, Edale | Small fault off setting ironstone bands. Lower fault core with calcite; upper part fans to fracture zone.  | MDFEST | E2a |
| 1067 | SK 09566 85531 | West of Lee House, west of Upper Booth, Edale | Dark grey ferruginous mudstone, slightly calcareous, with goniatite; sample of carbonate bullion. | CAMDST | R1a1 |
| 1068 | SK 09566 85531 | West of Lee House, west of Upper Booth, Edale | Dark grey shale, very ferruginous, finely laminated with abundant goniatites. | SHMDM | R1a1 |
| 1069 | SK 09566 85531 | West of Lee House, west of Upper Booth, Edale | Soft claystone, less fissile, paler in weathered section, with abundant fossils. | SHMDM | R1a |
| 1070 | SK 10260 85476 | Stream bank north of Upper Booth, Edale | Medium dark fissile mudstone.  | MDST | H1a |
| 1071 | SK 10278 85610 | Stream bank north of Upper Booth, Edale  | Med grey to dark grey, fissile, calcareous mudstone.  | CAMDST | H1b |
| 1072 | SK 10978 84783 | Section in River Noe near Barber Booth, Edale | *C. malhamense* MB - within thick succession of calcareous mudstones with abundant brachiopods. | SHMDM | E1c1 |
| 1159  | SK 10184 85968 | Crowden Clough, Edale | Dark grey mudstone with medium-dark grey siltstone beds (cm-scale); coarse micas. | MDSI | R1c1 |
| 1160  | SK 10206 85749 | Crowden Clough, Edale | Dark grey mudstone. | MDST | R1b1 |
| 1161  | SK 10206 85749 | Crowden Clough, Edale | Limestone nodule of cm-scale bedding from dark grey bituminous mudstone to bioclastic limestone with goniatite spat.  | LST | R1b1 |
| 1162  | SK 10248 85670 | Crowden Clough, Edale | Mudstone, dark grey, fissile, with abundant small brachiopods and goniatites. | SHMDM | H2c2 |
| 1163 (\*) | SK 10248 85670 | Crowden Clough, Edale | Mudstone, dark grey, fissile, with abundant small brachiopods and goniatites. | SHMDM | H2c2 |
| 1164  | SK 10271 85217 | Stream bank south of Upper Booth, Edale | Orbiculoidea-type brachiopods  | SHMDM | E2a2 |
| 1165 (\*) | SK 10271 85217 | Stream bank south of Upper Booth, Edale | Small fault off setting ironstone bands. Lower fault core with calcite; upper part fans to fracture zone.  | MDFEST | E2a2 |
| 1166  | SK 10927 84785 | Section in River Noe near Barber Booth, Edale | Fractures zone in black mudstone. Calcite bearing fractures sampled.  | MDLM | E2a |
| **Craven Basin (See Fig. 3 for location map):** |
| 1073 | SD 64469 53466 | Hind Clough, WSW of Lower Brennand  | Calcareous, medium dark grey, very thinly bedded mudstone with brachiopod traces.  | MDLM | P2c |
| 1074 (\*) | SD 64488 53563 | Hind Clough, WSW of Lower Brennand | Thin bed of fine to medium grained, micaceous sandstone. Siliceous with lamina of calcite cement. | SDST | P2 |
| 1075 | SD 72166 57221 | Near confluence of the River Hodder and Hasgill Beck  | Muddy ferruginous and calcareous mudstones. | MDFEST | P2b |
| 1076 | SD 59213 44981 | NE of Blindhurst | *T. pseudobilinguis* MB (lower). | SHMDM | E1b2 |
| 1077 (\*) | SD 59213 44981 | NE of Blindhurst | Dolomitic sandstone. | DSDST | E1b2 |
| 1078 | SD 59213 44981 | NE of Blindhurst | *T. pseudobilinguis* MB (upper). | SHMDM | E1b2 |
| 1079 (\*) | SD 59213 44981 | NE of Blindhurst | Fossil ?Orthocone. | MDST | E1b |
| 1080 | SD 72707 35356 | Butler Clough SSW of Whalley Abbey | Calcareous mudstone *C. malhamense* MB. | CAMDST | E1c1 |
| 1081 | SD 72688 35374 | Butler Clough SSW of Whalley Abbey | Micaceous mudstone near ?*T. Pseudobilinguis* MB. | MDST | E1b2 |
| 1082 | SD 75156 37628 | Light Clough, Wiswell | Mudstone near *C. leion* MB. | MDST | E1a1 |
| 1083 | SD 75211 37560 | Light Clough, Wiswell | Black mudstone. | MDST | E1b2 |
| 1084 | SD 74921 37453 | Light Clough, Wiswell | Calcareous mudstone near *S. splendens* MB. | CAMDST | P2 |
| 1100 (\*) | SD 75156 37628 | Light Clough, Wiswell | Calcareous mudstone with ?goniatite, near *C. leion* MB. | CAMDST | E1a1 |
| 1085 (\*) | SD 81192 43217 | Red Syke, Twiston | Crinoidal grainstone. | LST | P1a |
| 1086 | SD 83238 44270 | Red Syke, Twiston | Calcareous mudstone with with goniatite. | CAMDST | P1a |
| 1087 (\*) | SD 83238 44270 | Red Syke, Twiston | Mudstone. | MDST | P1a |
| 1088 | SD 83231 44112 | Red Syke, Twiston | Pyritic mudstone below base of Pendleside Sandstone. | SHMDM | P1a |
| 1089 | SD 85923 44973 | Weets Hill, Barnoldswick | Mudstone. | MDST | E1c1 |
| 1090 | SD 85923 44973 | Weets Hill, Barnoldswick | Mudstone, calcareous. | CAMDST | E1c1 |
| 1091 | SD 97895 49183 | Carla Beck, Skipton | Mudstone. | MDST | E1 |
| 1092 | SD 84464 62377 | Scaleber Force | Mudstone | MDST | P2 |
| 1093 (\*) | SD 84464 62377 | Scaleber Force | Grainstone. | LST | P2 |
| 1094 (\*) | SD 84464 62377 | Scaleber Force | Wackestone. | LST | P2 |
| 1095 (\*) | SD 84088 62568 | Scaleber Force  | Scaleber Force Limestone. | LST | BB |
| 1096 | SD 84986 58750 | Newton Gill, Long Preston  | Fossiliferous mudstone. | SHMDM | E1 |
| 1097 | SD 85026 58674 | Newton Gill, Long Preston  | Fossiliferous mudstone. | SHMDM | P2 |
| 1098 | SD 85031 58654 | Newton Gill, Long Preston  | Mudstone, calcareous. | CAMDST | P2 |
| 1099 (\*) | SD 85093 58393 | Newton Gill, Long Preston  | Fossiliferous limestone. | LST | B2-P1c |

(\*) No geochemical data

Rock Classification Scheme (RCS) code: CAMDST, Calcareous mudstone; DSDST, Dolomitic sandstone; MB, Marine Band; MDFEST, Mudstone and ironstone; MDLM, Mudstone and limestone, interbedded; MDSI, Mudstone and siltstone; MDST, Mudstone; LST, Limestone; SDST, Sandstone; and SHMDM, Shelly marine mudstone. See Fig. 2 for age indices.