

Description of Additional Supplementary Files

File Name: Supplementary Data 1

Description: SIMS data ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$) and LA-MC-ICP-MS data ($^{87}\text{Sr}/^{86}\text{Sr}$) of calcite, including measurements of reference materials.

File Name: Supplementary Data 2

Description: SIMS data for $\delta^{34}\text{S}$ in pyrite.

File Name: Supplementary Data 3

Description: Fluid inclusion data in fracture coating calcite.

File Name: Supplementary Data 4

Description: LA-ICP-MS U-Pb carbonate geochronology analytical data.

File Name: Supplementary Data 5

Description: Summary table for carbonate U-Pb geochronology.

File Name: Supplementary Data 6

Description: Analytical Conditions for U-Pb geochronology.

File Name: Supplementary Data 7

Description: n-Alkane and regular isoprenoid parameters in ground coating samples.

File Name: Supplementary Data 8

Description: Gas compositions from the boreholes.