

GSA Data Repository Item 2017303

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DATA REPOSITORY

Appendix 1. SIMS_data

Supplemental Figure DR1.

Supplemental Figure DR2.

Supplemental Figure DR3.

Supplemental Figure DR4.

Movie File B1.

Movie File B3.

Movie File LCL.

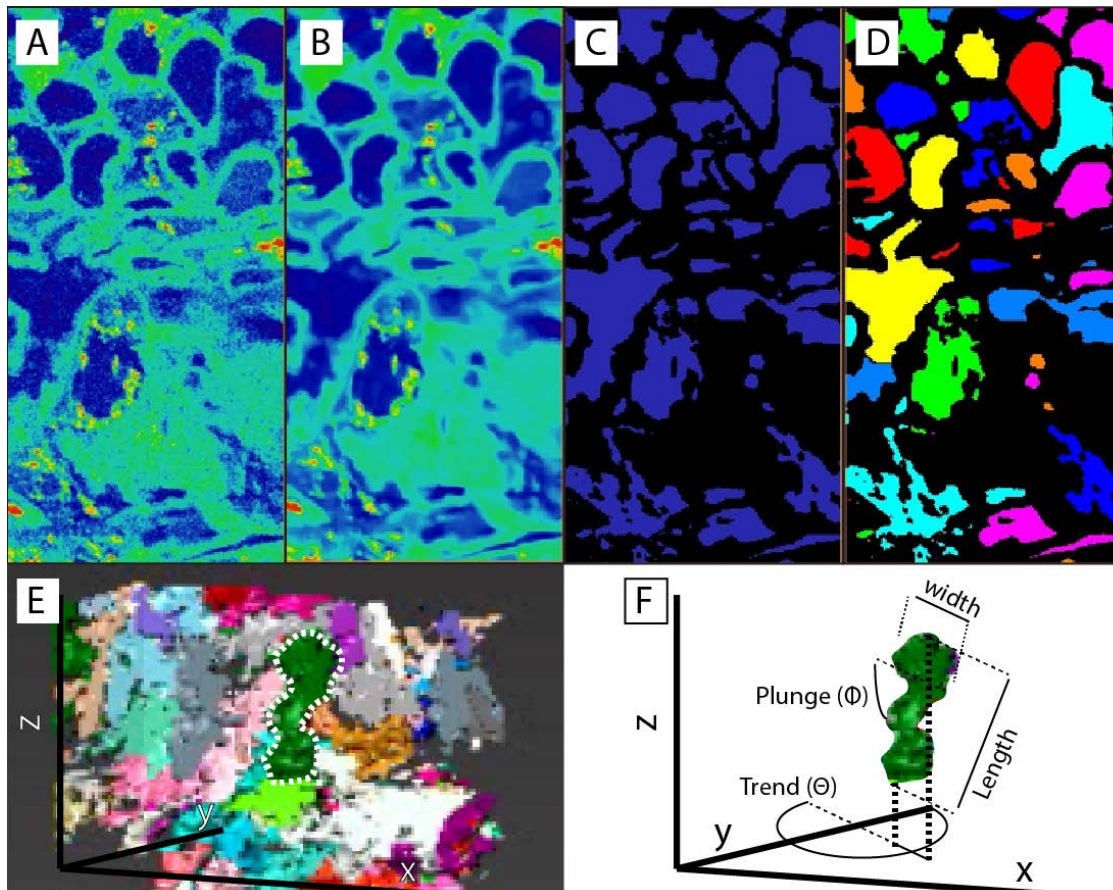
Movie File LCM.

Movie File M1.

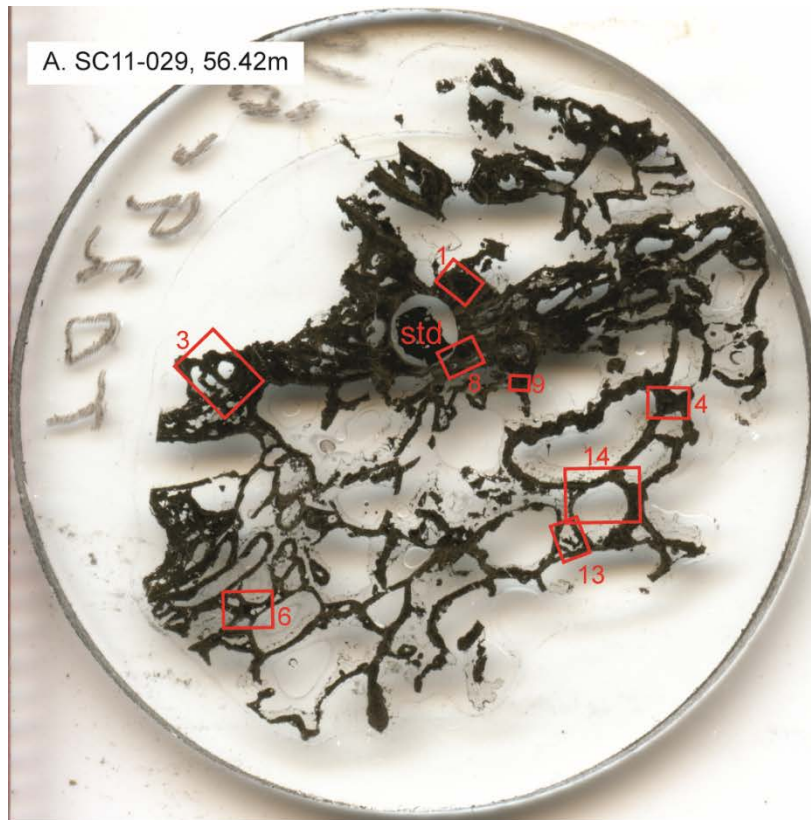
Pyrite-walled tube structures in a Mesoproterozoic sediment-hosted metal sulfide deposit

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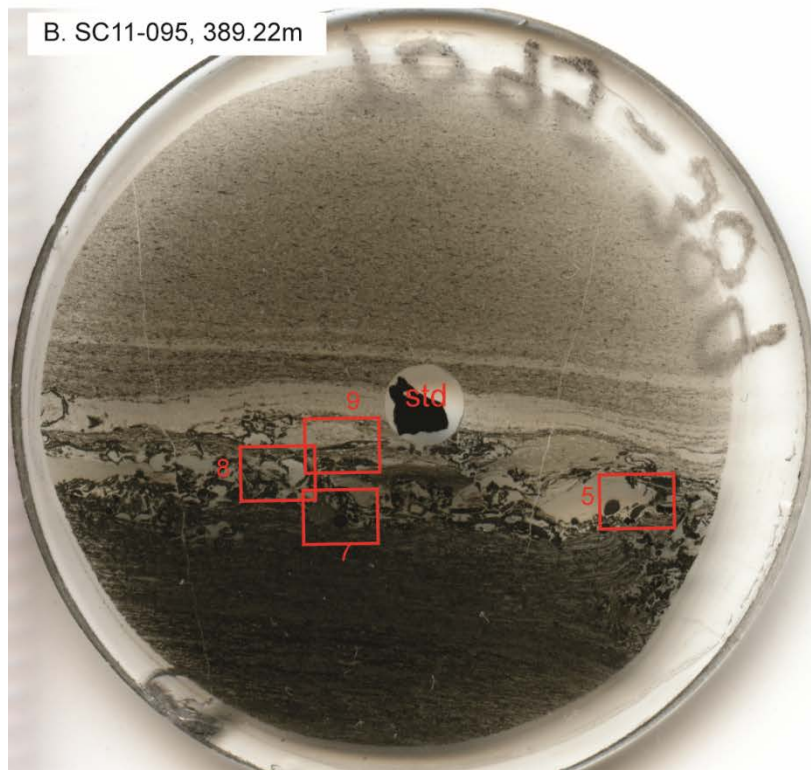
SUPPLEMENTAL FIGURES & MOVIES

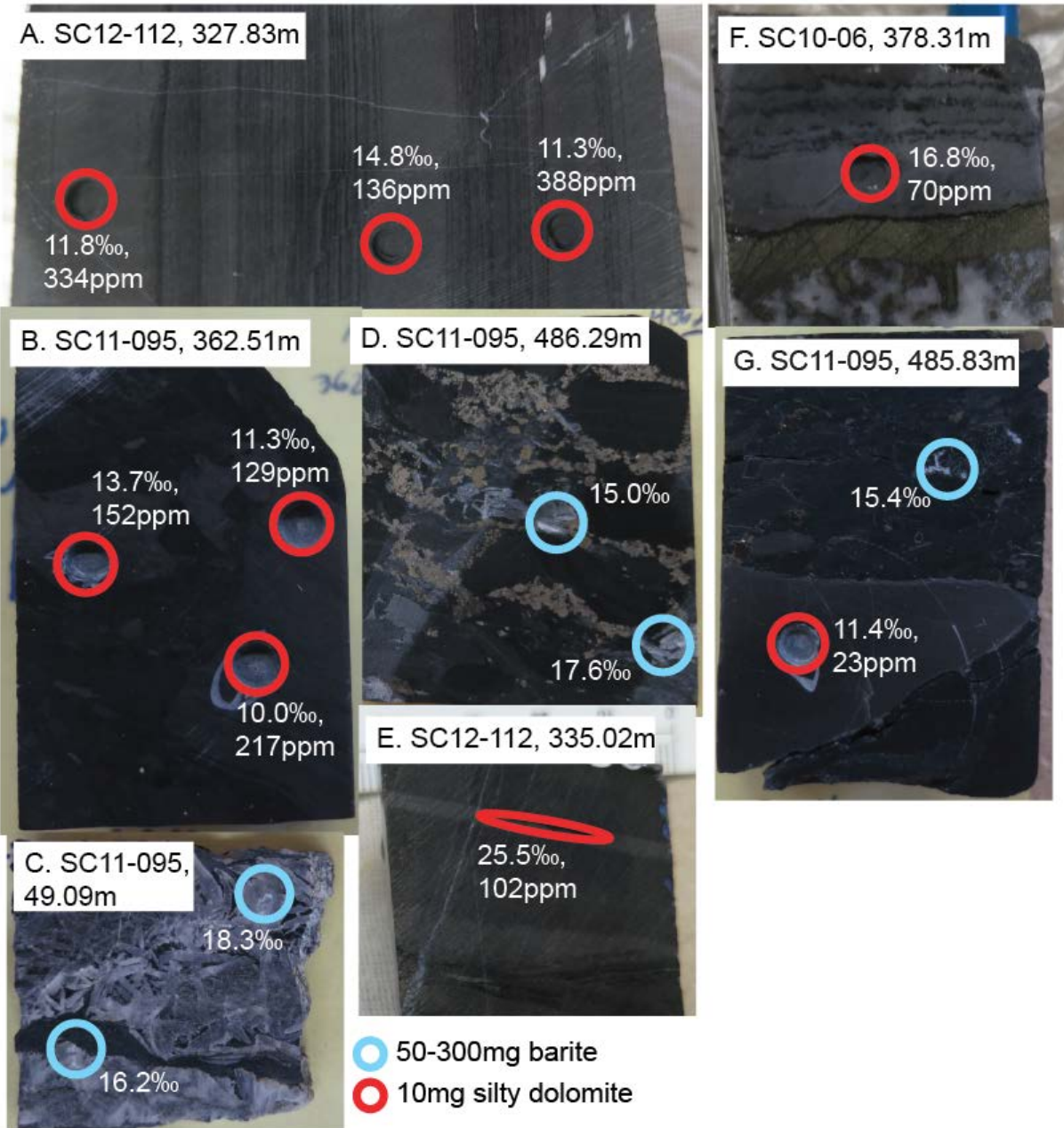


Supplemental Figure DR1: Example of the workflow in Avizo Fire used to create pore data. (A) Raw micron-scale density data from a sub-volume of sample B1. (B) Three-dimensional image filtering result from the edge-preserving, curvature-driven smoothing parameter. (C) Result of the pore determination by an interactively-determined threshold density contrast with wall material. Black is all density values greater than a threshold. (D) Result of the labeling command to identify and separate individual pore volumes, which are now colored arbitrarily. (E) Three-dimensional view of the individually-labeled and colored pore volumes with a vertical z-axis and arbitrary horizontal x-y axes. (F) Quantifiable parameters describing each pore includes the volume, the longest and intermediate axes lengths of the pore (length and width), the aspect ratio (length/width), the angle between vertical and the long axis (plunge, Φ), and the trend direction (Θ) of the pore in the horizontal plane.

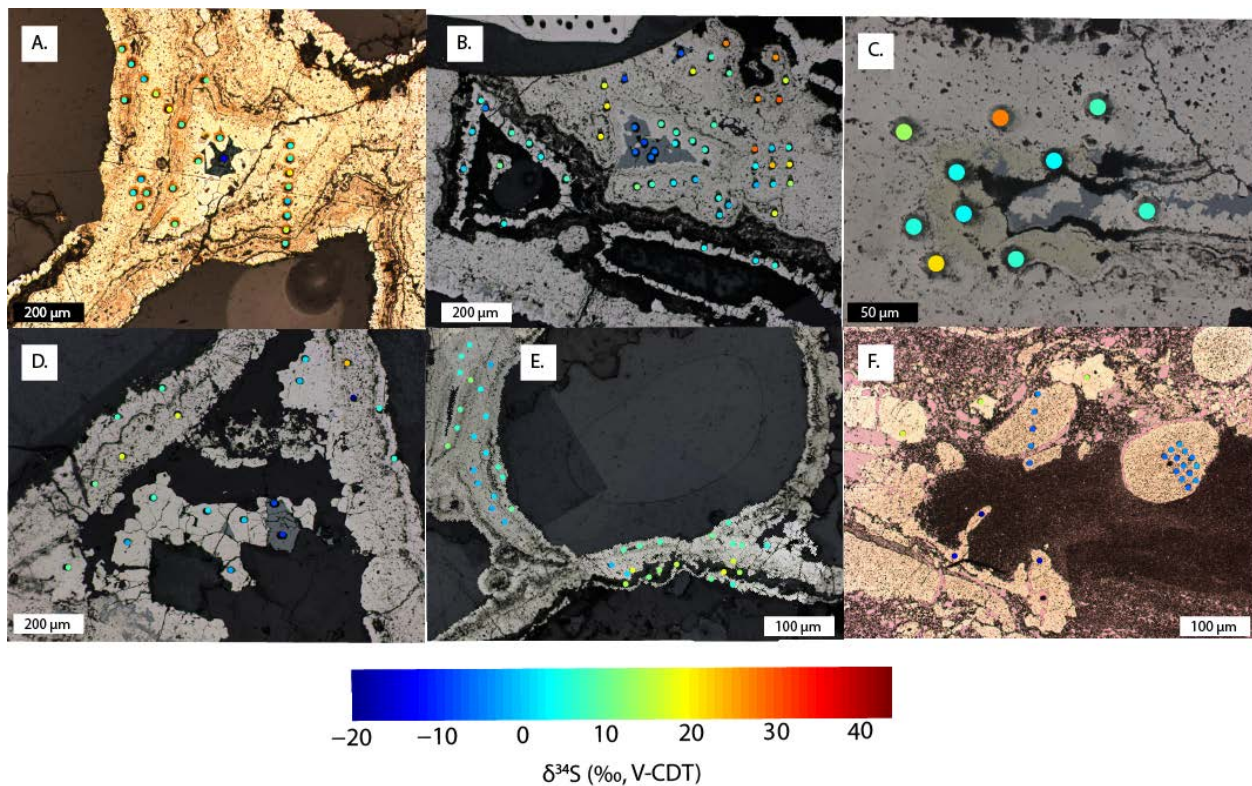


Supplemental Figure DR2:
One-inch (2.54 cm) round polished thick sections mounted with in-house pyrite analytical standard (std). *In situ* sulfide-sulfur analytical sites are boxed and numbered as in Figure 8 and Supplemental Figure 4. Thick sections are both cut perpendicular to bedding.





Supplemental Figure DR3: Non-sulfide textures sampled for this study, in addition to the sample shown in Figure 5E. Silty dolomite CAS samples are circled in red, and barite samples are circled in blue. All samples are from 3 cm-wide quarter-core segments. (A) Dolomitic caps of graded laminations below the LSZ in laminated striped shale lithofacies from core SC12-112-327.83 m. (B) Dolostone clasts in clast-supported debris flow above the USZ, in a unit called Unit 0, from core SC11-095-362.51 m. (C) Synsedimentary barite lathes that precipitated prior to sediment compaction in the upper Newland Formation from core SC11-095-49.09 m. (D) Synsedimentary barite lathes being replaced by pyrite in the USZ from core SC11-095-486.29 m. (E) Dolomitic cap of graded lamination below the LSZ in laminated striped shale lithofacies from core SC12-112-335.02 m. (F) Dolostone clast in pyrite-cemented breccia in the MSZ from core SC10-06-378.31 m. (G) Dolostone clast and porosity-filling barite in clast-supported debris flow in the USZ from core SC11-095-485.83 m.



Supplemental Figure DR4: Additional SIMS sulfide-sulfur $\delta^{34}\text{S}$ analysis pits colored by isotopic composition overlain on plain-polarized reflected light photomicrographs. (A) SC11-029-56.42 m, Site 4. (B) SC11-029-56.42 m, Site 8. (C) SC11-029-56.42 m, Site 9. (D) SC11-029-56.42 m, Site 13. (E) SC11-029-56.42 m, Site 14. (F) SC11-095-389.22 m, Site 5.

Supplemental Movie B1: USZ sample from Black Butte with pyrite walls and minimal porosity occlusion from drill core SC11-029-56.5 m (Figure 1C). The sample is approximately 2 x 3 x 6 cm. In the first 20 s, grayscale is proportional to density, with solid white indicating minor barite and middle gray indicating sulfide minerals. 0-6 s: perspective view of the exterior of sample, which is a quarter segment of drill core. 6-20 s: vertical slices through the sample. In the remainder of the video, individual pore volumes are colored and all material denser than a threshold value is removed. Separate pores sharing a color are not connected. 20-22 s: all pores with volume greater than 0.05 mm³. 22 s-1 min: Pores are filtered to only show those oriented with plunge of 45° to 65°. Reconstruction is rotated to show three-dimensional shape of pores.

Supplemental Movie B3: Silica-replaced outcrop sample from 46° 46.368'N, 110° 52.843'W above USZ gossan (Figure 1A). Sample is approximately 1.5 x 3 x 2.5 cm. Grayscale is proportional to density, with solid white indicating the densest silica. Tube structure walls are missing, and therefore appear as black stringers most visible on the outer surface of the sample where weathering has accentuated the relief. 0-16 s: perspective view of the exterior of the sample, oriented up properly. 16-35 s: vertical slices through the sample. 35-49 s: horizontal slices through the sample.

Supplemental Movie LCL: Inactive carbonate-walled chimney from Lost City (sample 3871-1442 collected during *HOV Alvin* cruise AT-7-41). Sample is approximately 3.5 x 2 x 4.5 cm. Grayscale is proportional to density, with solid white indicating the densest carbonate. 0-6 s: perspective view of exterior of sample (no orientation information recorded on sample). 6-20 s: vertical slices through the sample. In the remainder of the video, individual pore volumes are colored and all material denser than a threshold value is removed. Separate pores sharing a color are not connected. 20-24 s: all pores with volume greater than 0.05 mm³. 24-54 s: Pores are filtered to only show those oriented with trend of 98° to 204°. Reconstruction is rotated to show three-dimensional shape of pores.

Supplemental Movie LCM: Carbonate-walled flange from Lost City called “IMAX” on an active 53-60°C vent on the Poseidon structure (sample 3869-1404 collected at Marker 2 during *HOV Alvin* cruise AT-7-41). Sample is approximately 3 x 2 x 4.5 cm. Grayscale is proportional to density, with solid white indicating the densest carbonate. 0-6 s: perspective view of exterior of sample, oriented up properly. 6-15 s: vertical slices through the sample.

Supplemental Movie M1: Anhydrite-walled chimney from a 300-311°C vent called “Hot Harold” in the Mothra vent field on the Juan de Fuca Ridge (collected during *HOV Alvin* cruise AT-15-23 on September 9, 2007 at 47°55.425660'N, 129°6.491760'W, 2278 m depth). Sample is approximately 4 x 5.5 x 8.5 cm. Grayscale is proportional to density, with solid white indicating the densest anhydrite. 0-6 s: perspective view of exterior of sample, oriented up properly. 6-20 s: vertical slices through the sample. 20-28 s: all pores with pore volumes greater than 0.05 mm³ are reconstructed within an interior volume. Individual pore volumes are colored and all material denser than a threshold value is removed. Separate pores sharing a color are not connected. Reconstruction is rotated to visualize three-dimensional shape.