

Appendix D: Damage Characterization

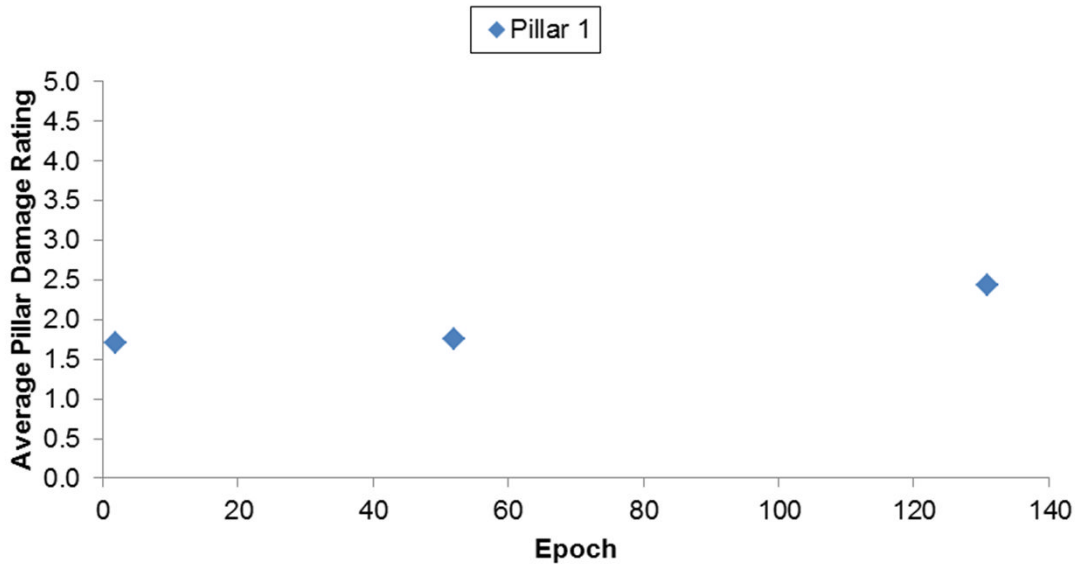


Figure D-1: Average Pillar Damage Rating vs. Epoch. Area 1

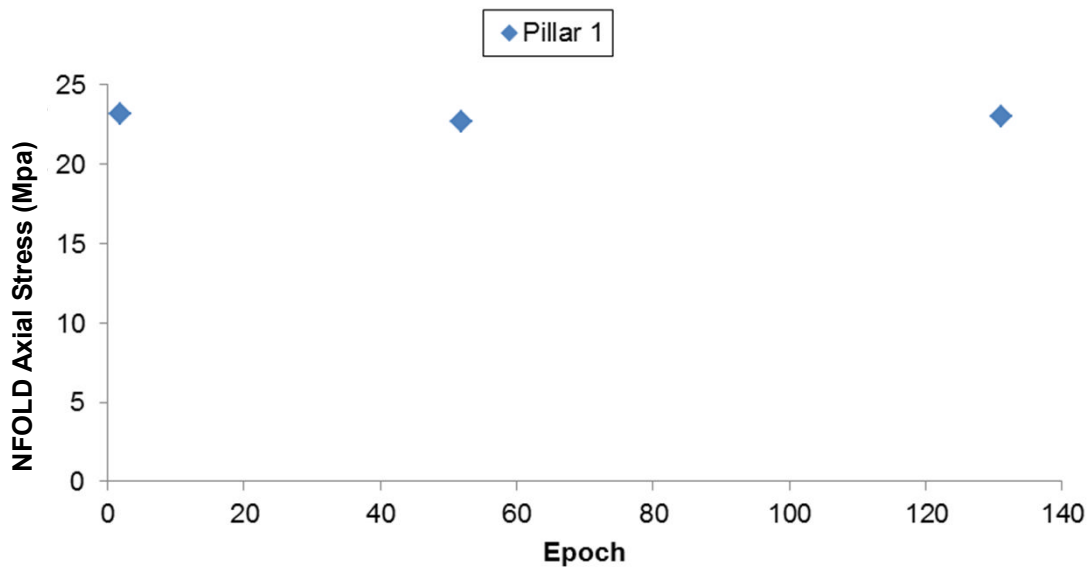


Figure D-2: NFOLD Predicted Normal Stress vs. Epoch. Area 1

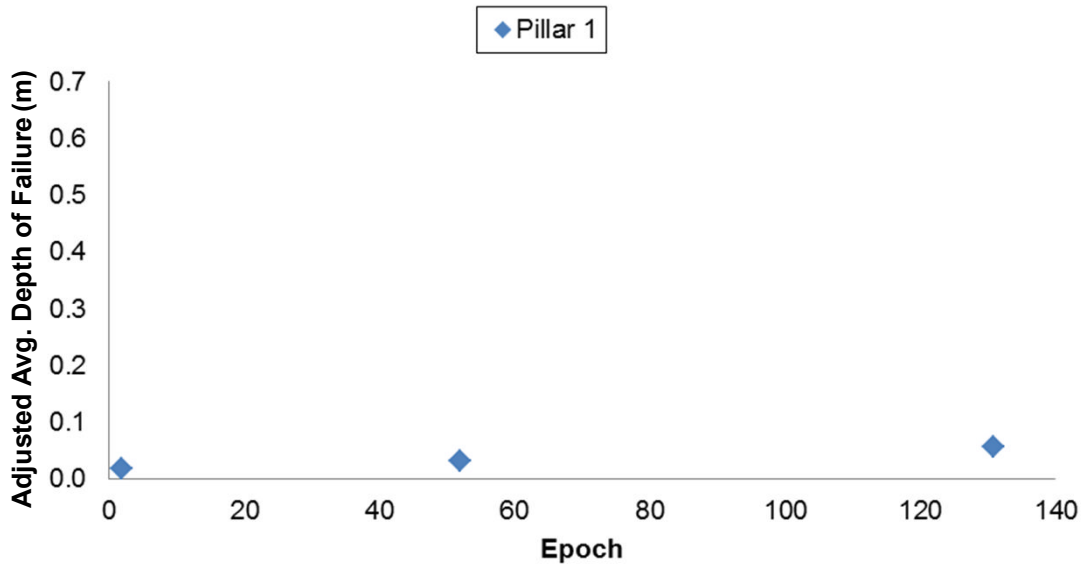


Figure D-3: Adjusted Average Depth of Failure vs. Epoch. Area 1

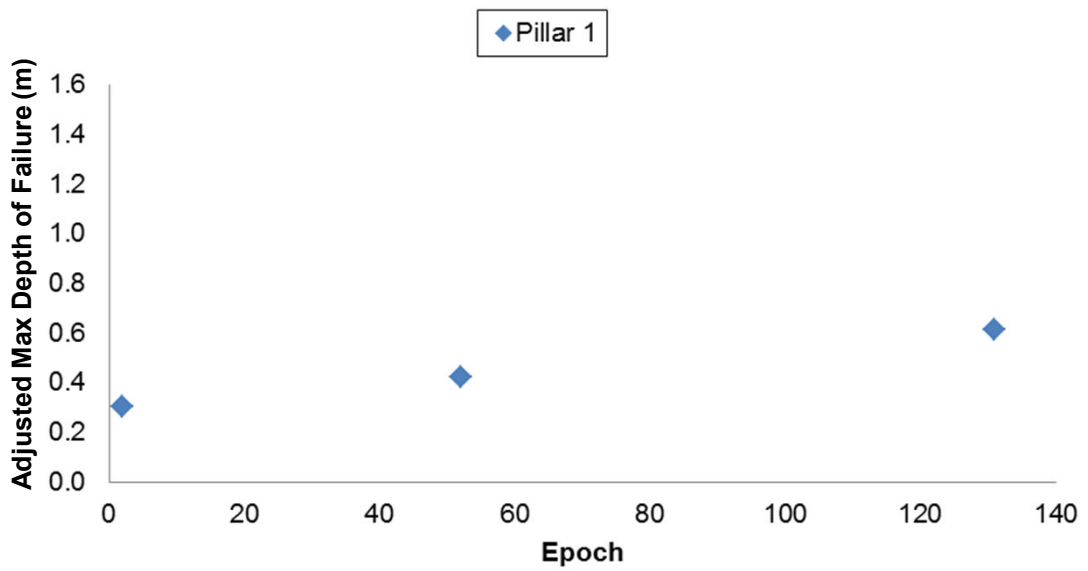


Figure D-4: Adjusted Maximum Depth of Failure vs. Epoch. Area 1

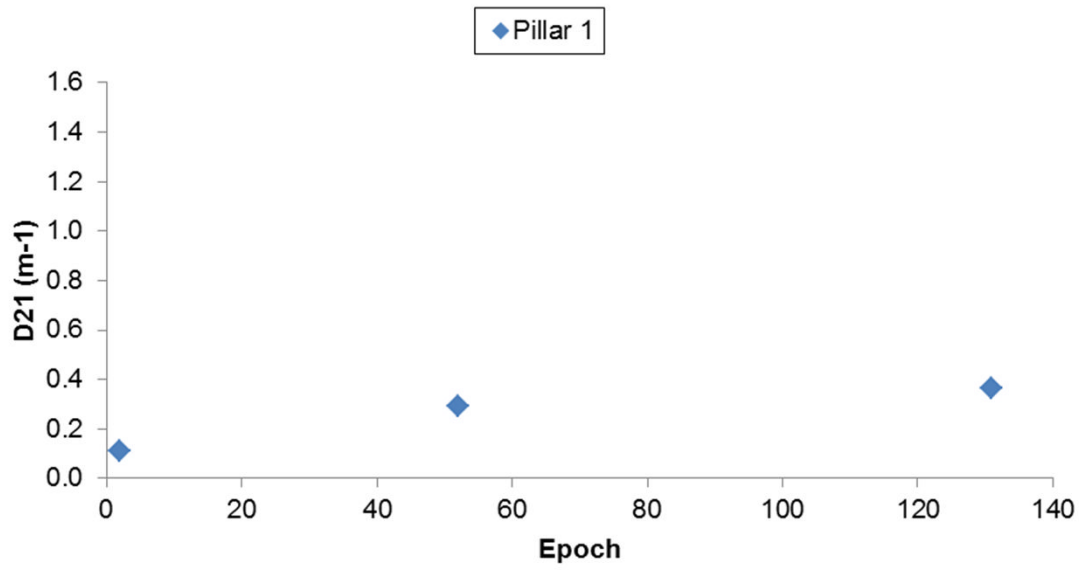


Figure D-5: D21 vs. Epoch. Area 1

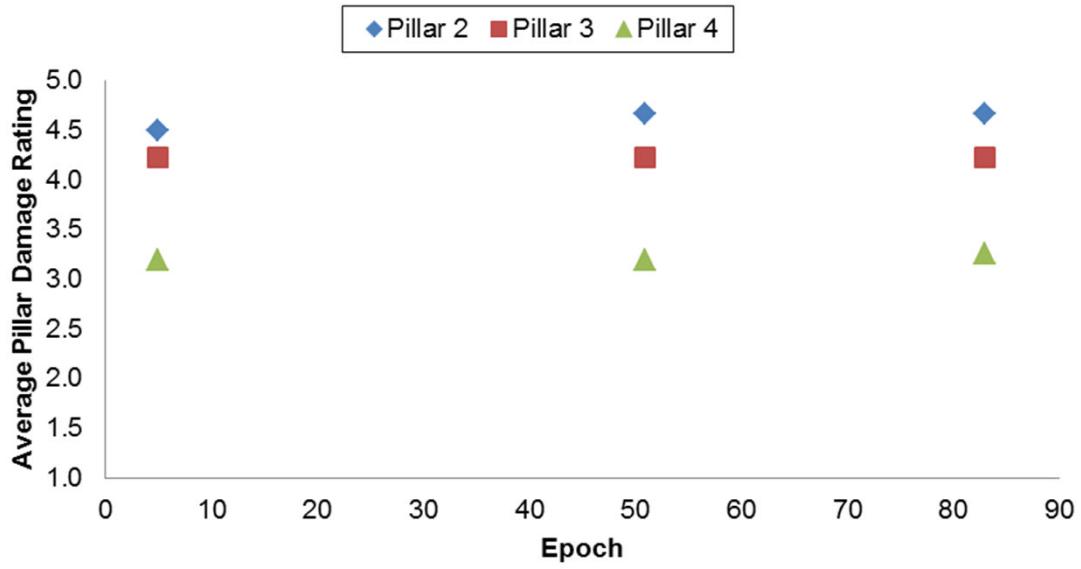


Figure D-6: Average Pillar Damage Rating vs. Epoch. Area 2

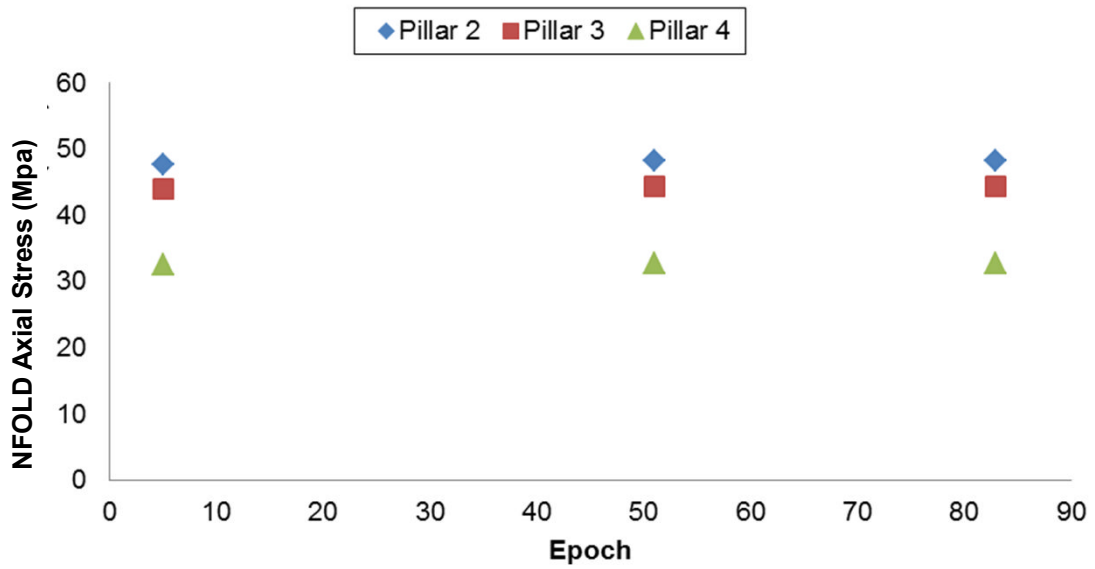


Figure D-7: NFOLD Predicted Normal Stress vs. Epoch. Area 2

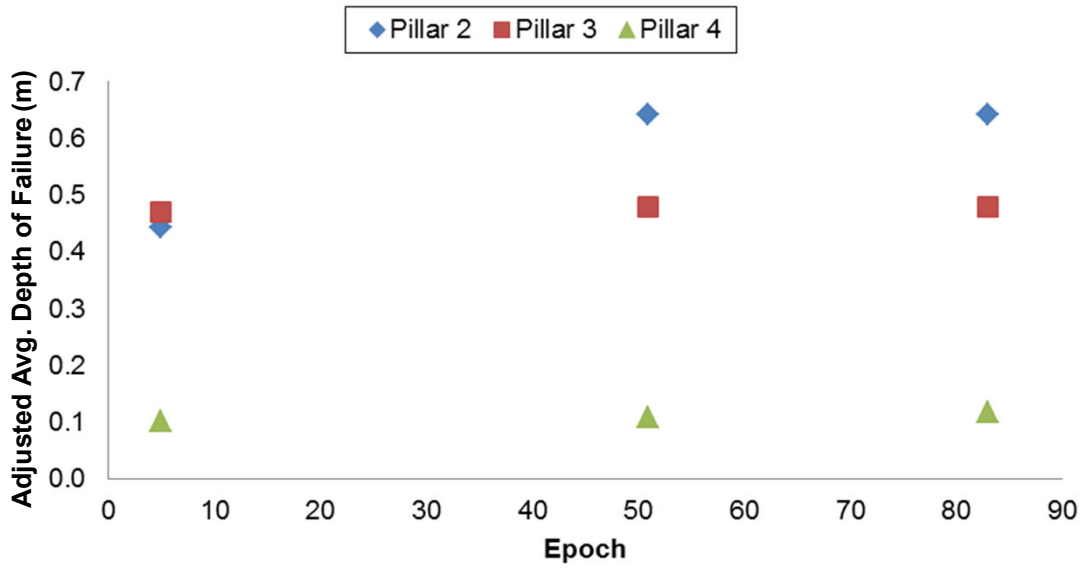


Figure D-8: Adjusted Average Depth of Failure vs. Epoch. Area 2

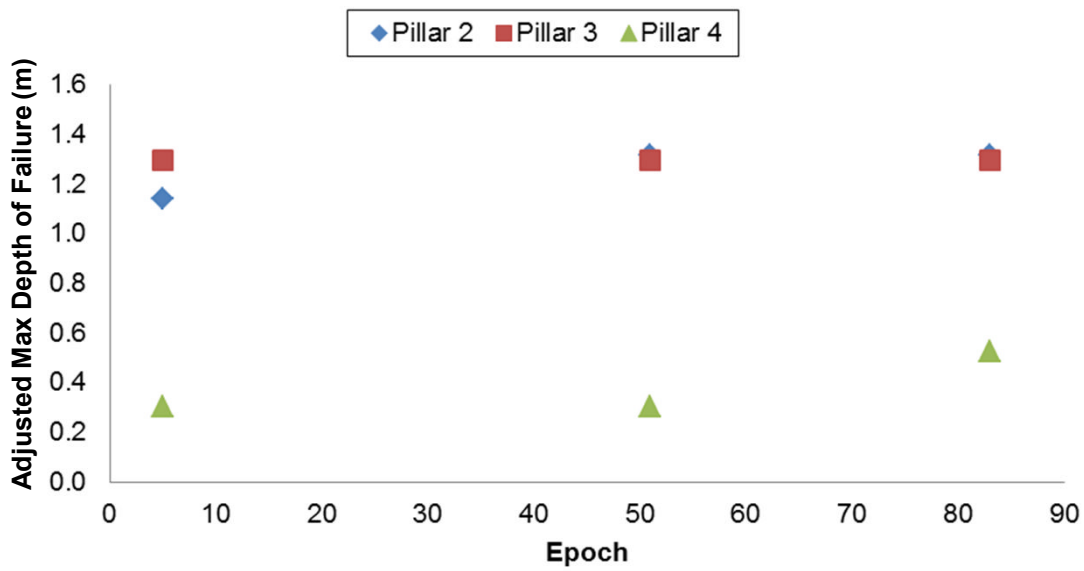


Figure D-9: Adjusted Maximum Depth of Failure vs. Epoch. Area 2

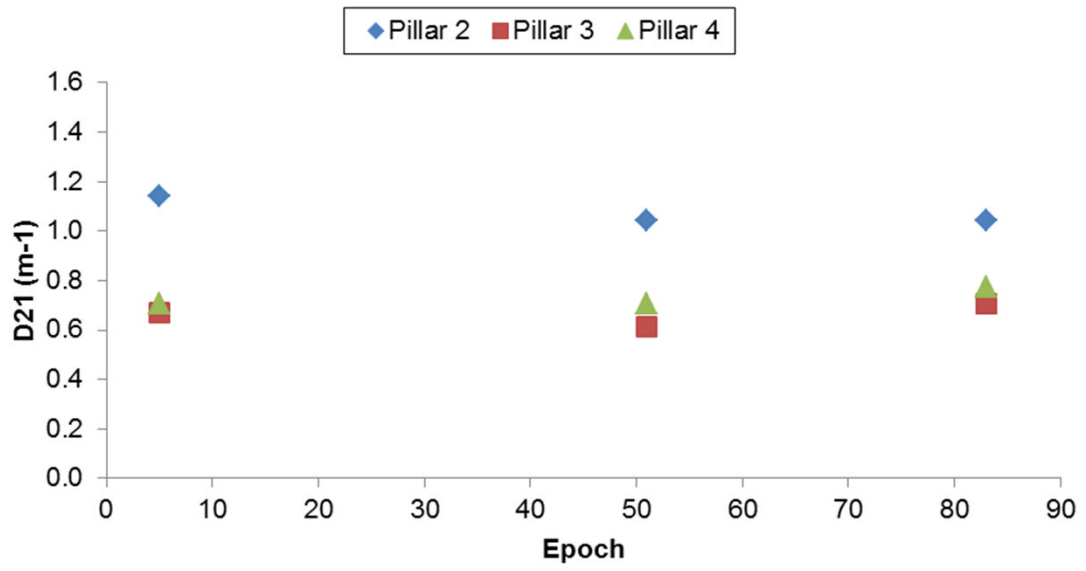


Figure D-10: D21 vs. Epoch. Area 2

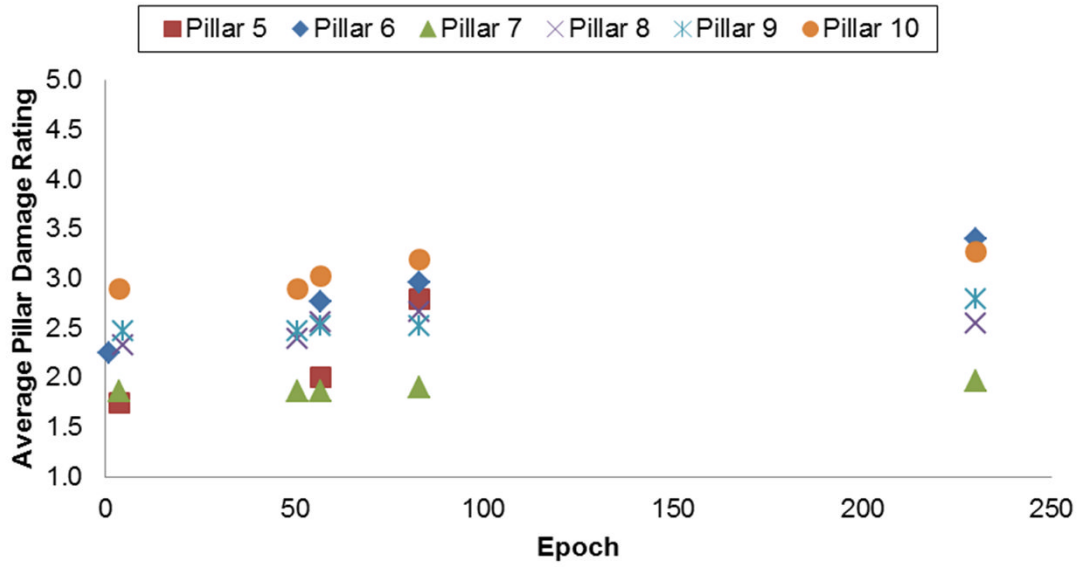


Figure D-11: Average Pillar Damage Rating vs. Epoch. Area 3

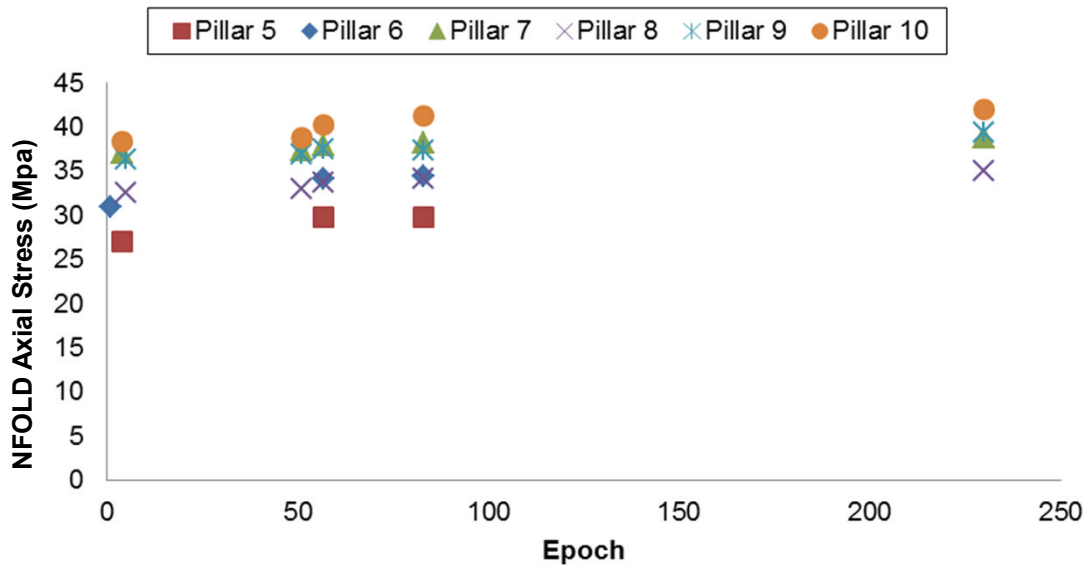


Figure D-12: NFOLD Predicted Normal Stress vs. Epoch. Area 3

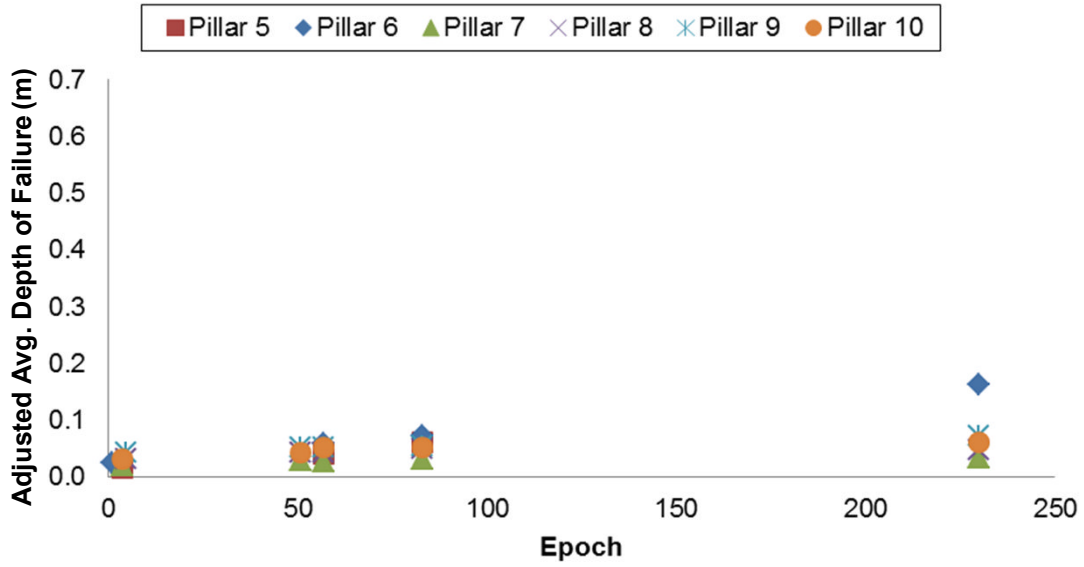


Figure D-13: Adjusted Average Depth of Failure vs. Epoch. Area 3

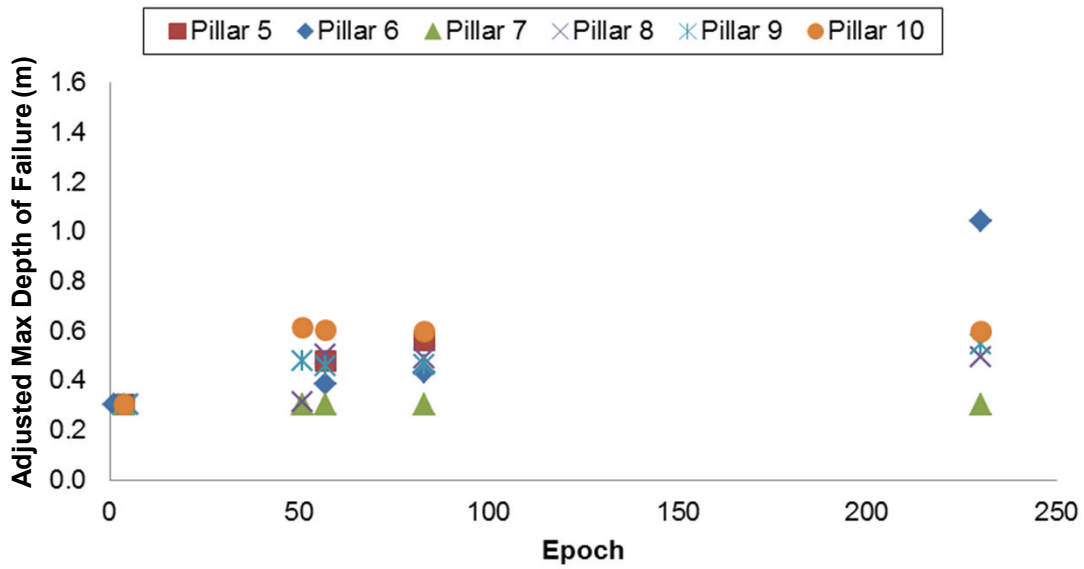


Figure D-14: Adjusted Maximum Depth of Failure vs. Epoch. Area 3

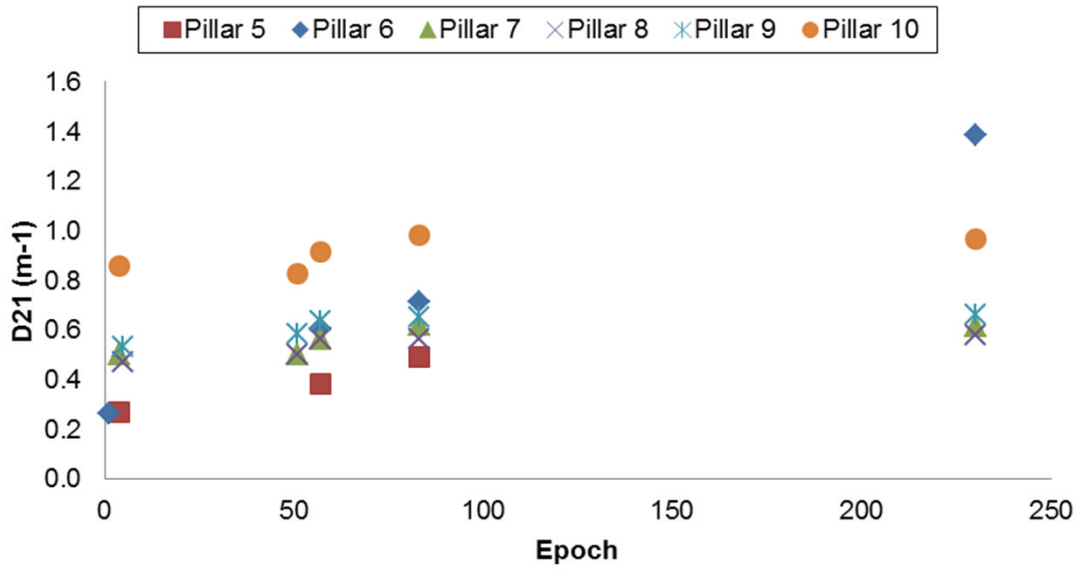


Figure D-15: D21 vs. Epoch. Area 3

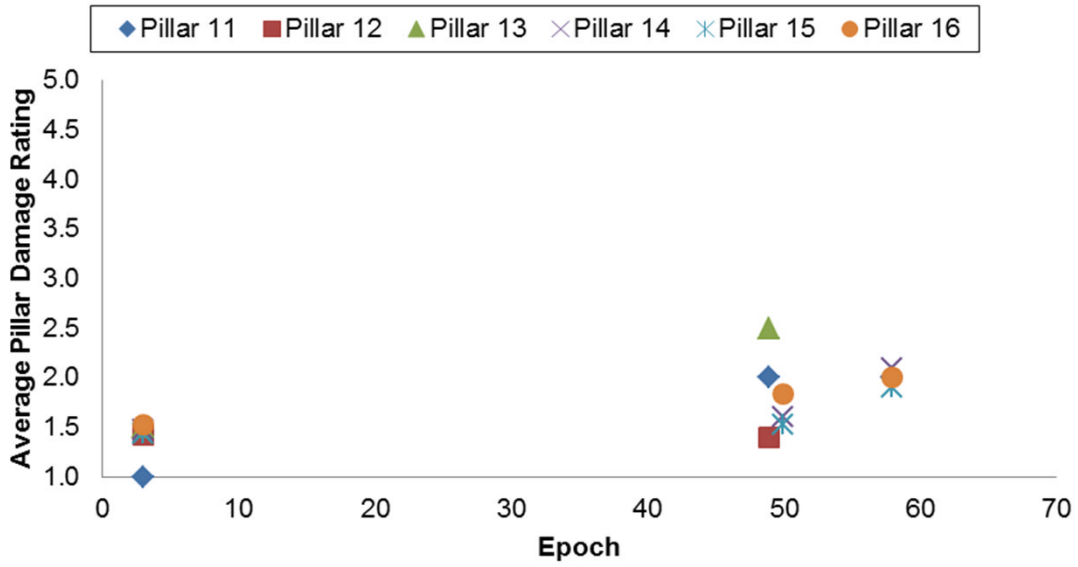


Figure D-16: Average Pillar Damage Rating vs. Epoch. Area 4

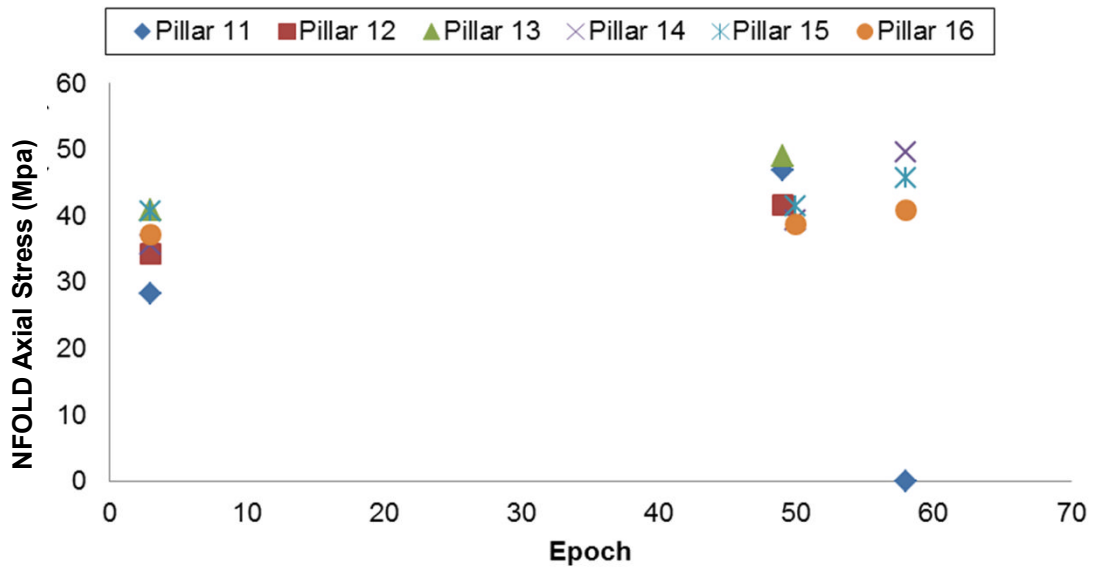


Figure D-17: NFOLD Predicted Normal Stress vs. Epoch. Area 4

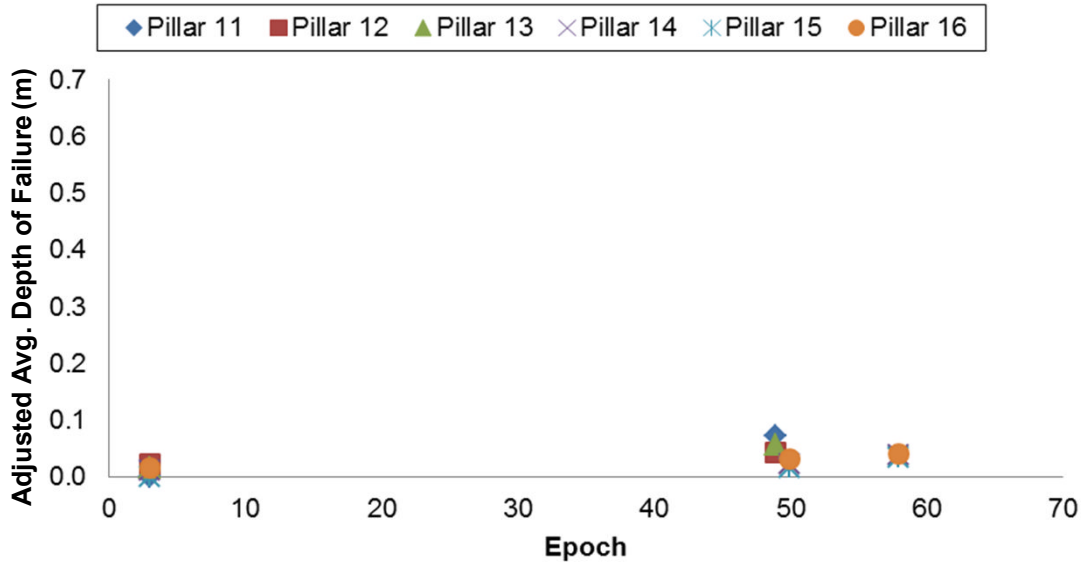


Figure D-18: Adjusted Average Depth of Failure vs. Epoch. Area 4

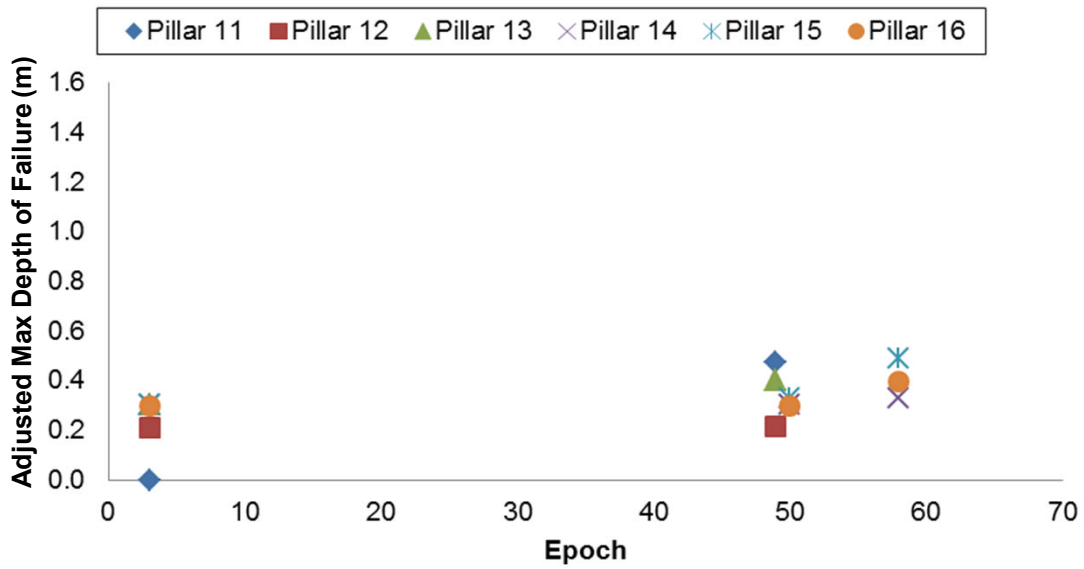


Figure D-19: Adjusted Maximum Depth of Failure vs. Epoch. Area 4

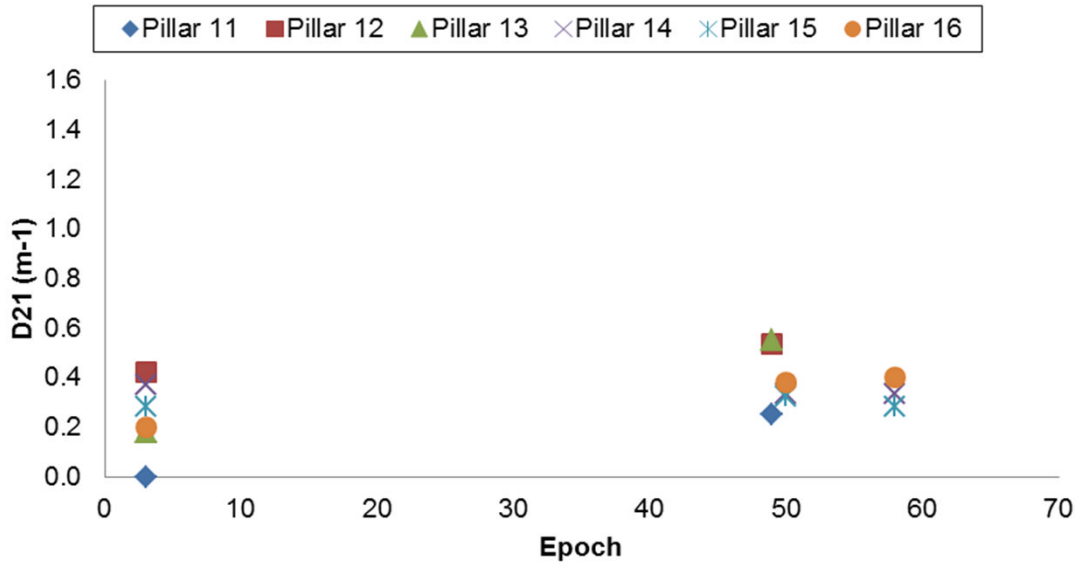


Figure D-20: D21 vs. Epoch. Area 4

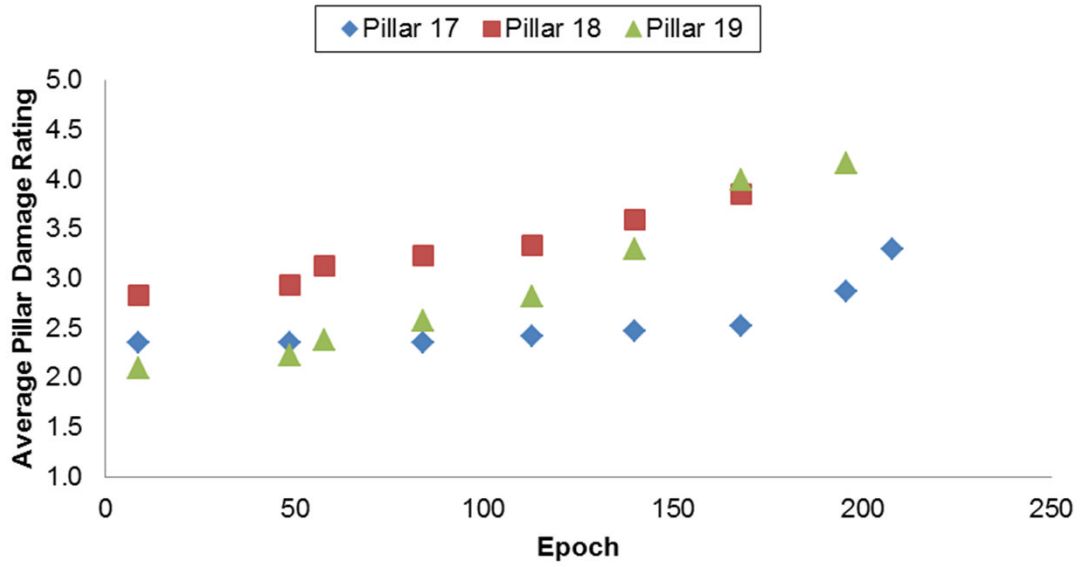


Figure D-21: Average Pillar Damage Rating vs. Epoch. Area 5

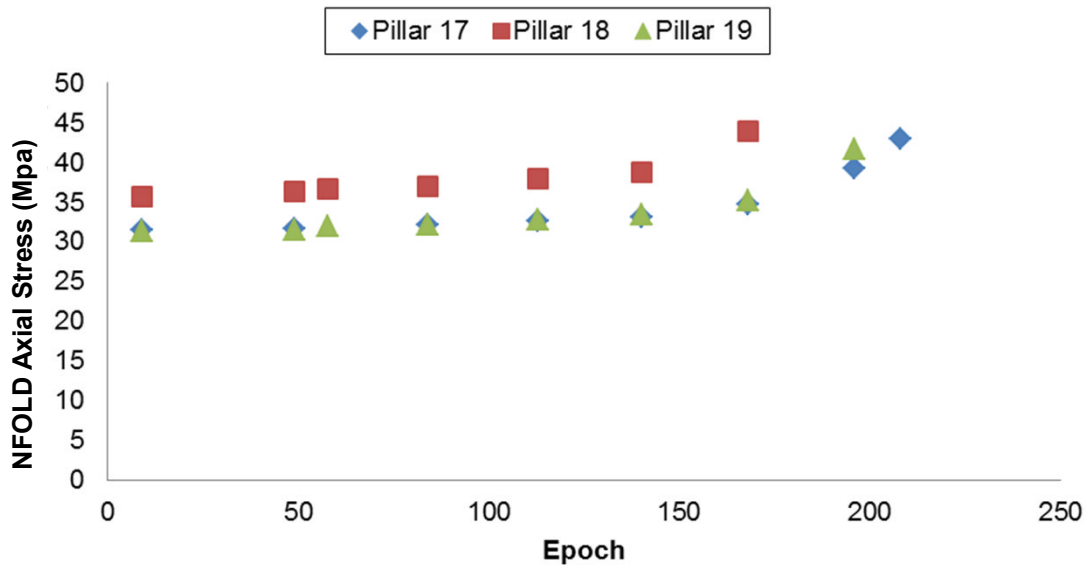


Figure D-22: NFOLD Predicted Normal Stress vs. Epoch. Area 5

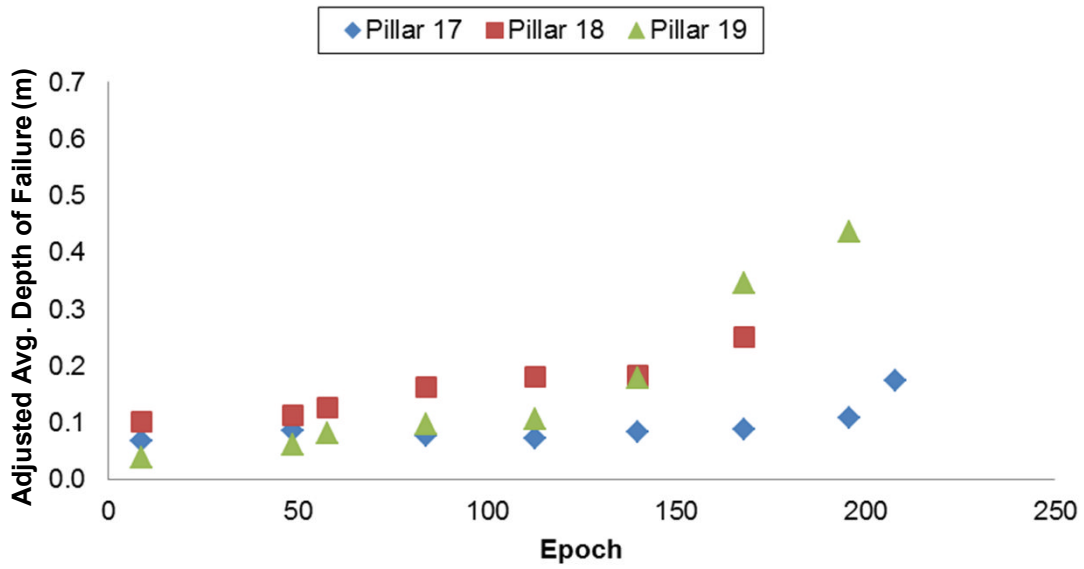


Figure D-23: Adjusted Average Depth of Failure vs. Epoch. Area 5

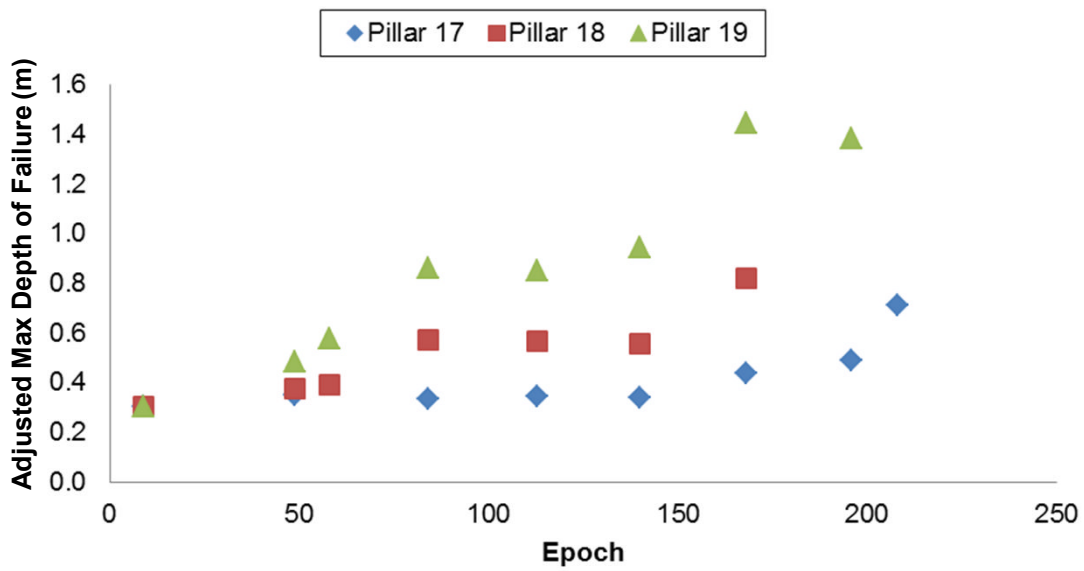


Figure D-24: Adjusted Maximum Depth of Failure vs. Epoch. Area 5

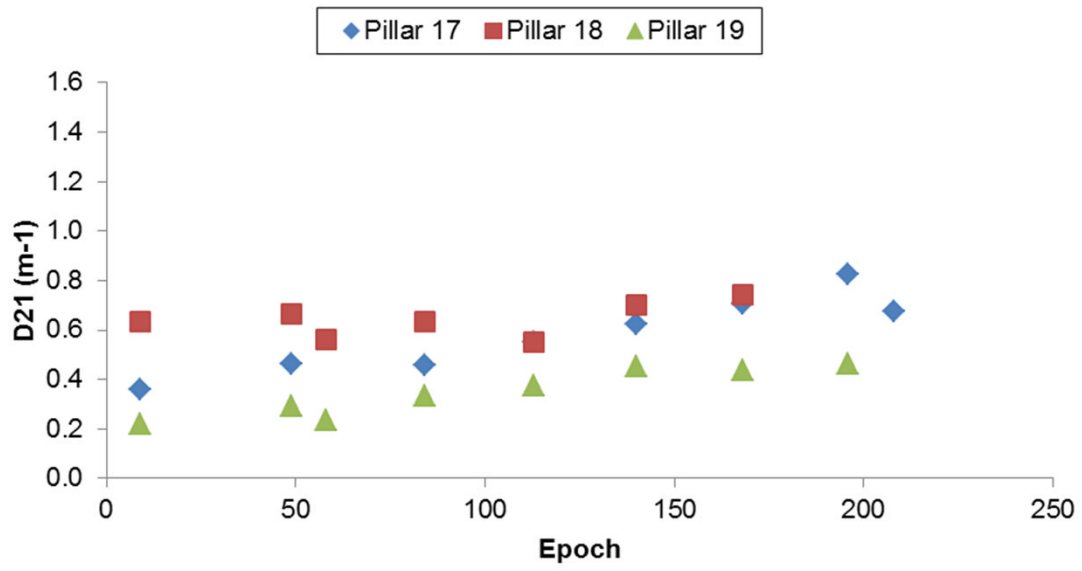


Figure D-25: D21 vs. Epoch. Area 5

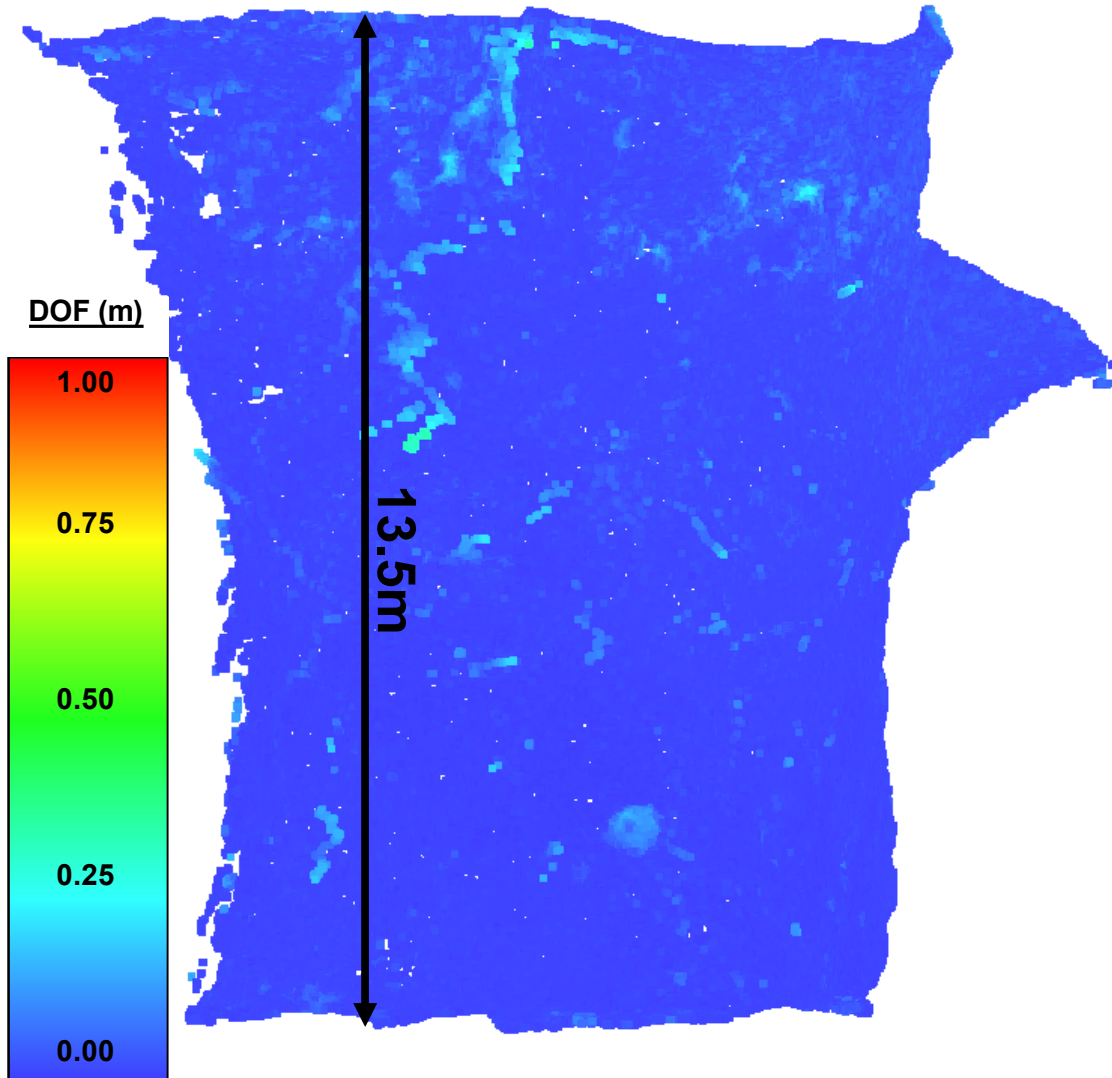


Figure D-26: Point Cloud of Pillar 1 with Depth of Failure Looking Northwest – Cumulative up to Epoch 52 – Adjusted Average Depth of Failure = 0.03 m

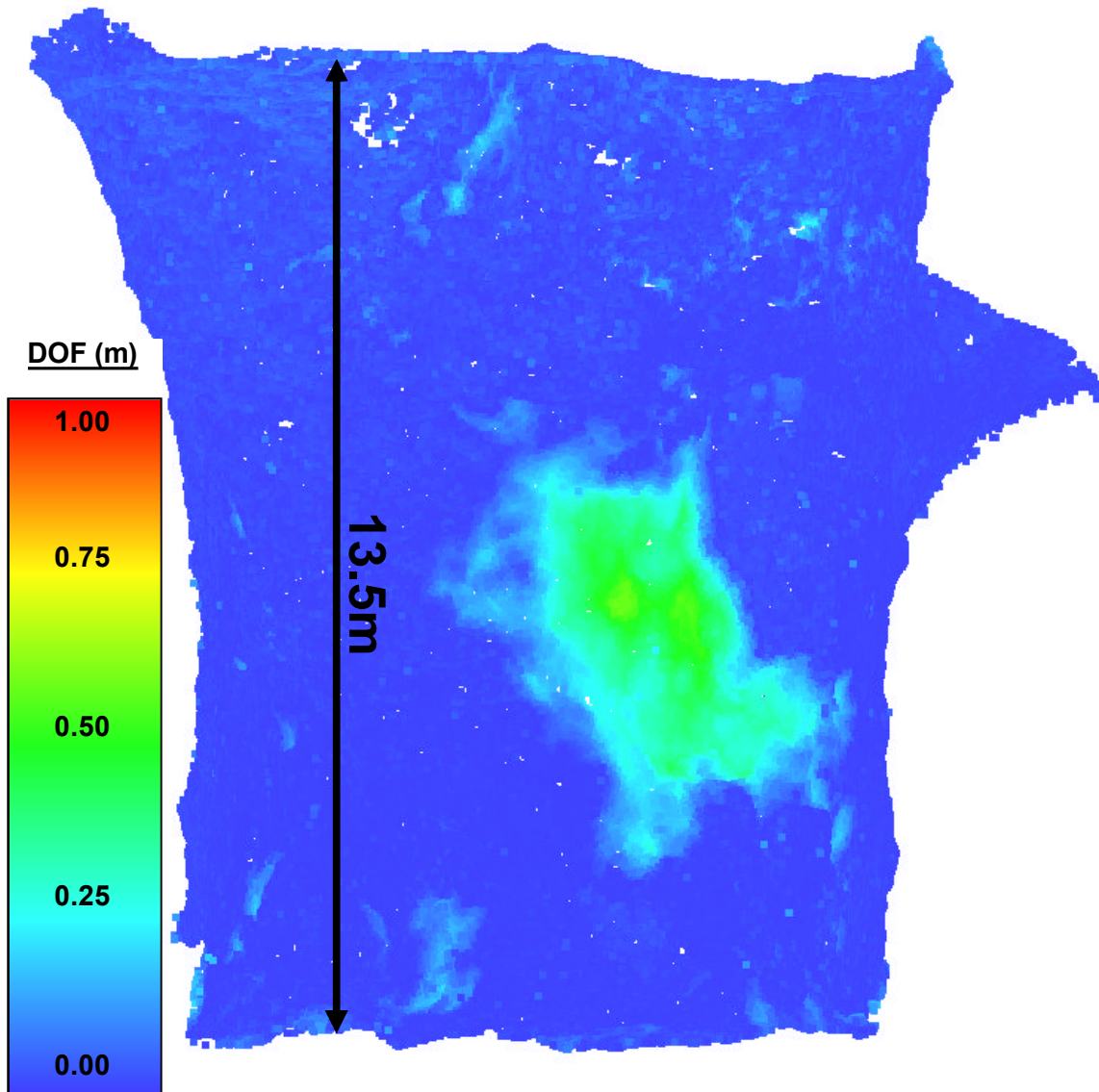


Figure D-27: Point Cloud of Pillar 1 with Depth of Failure Looking Northwest – Cumulative up to Epoch 131 – Adjusted Average Depth of Failure = 0.06 m. Failure controlled by Sub-Vertical Joints. Intact Rock Fracture as Horizontal Release

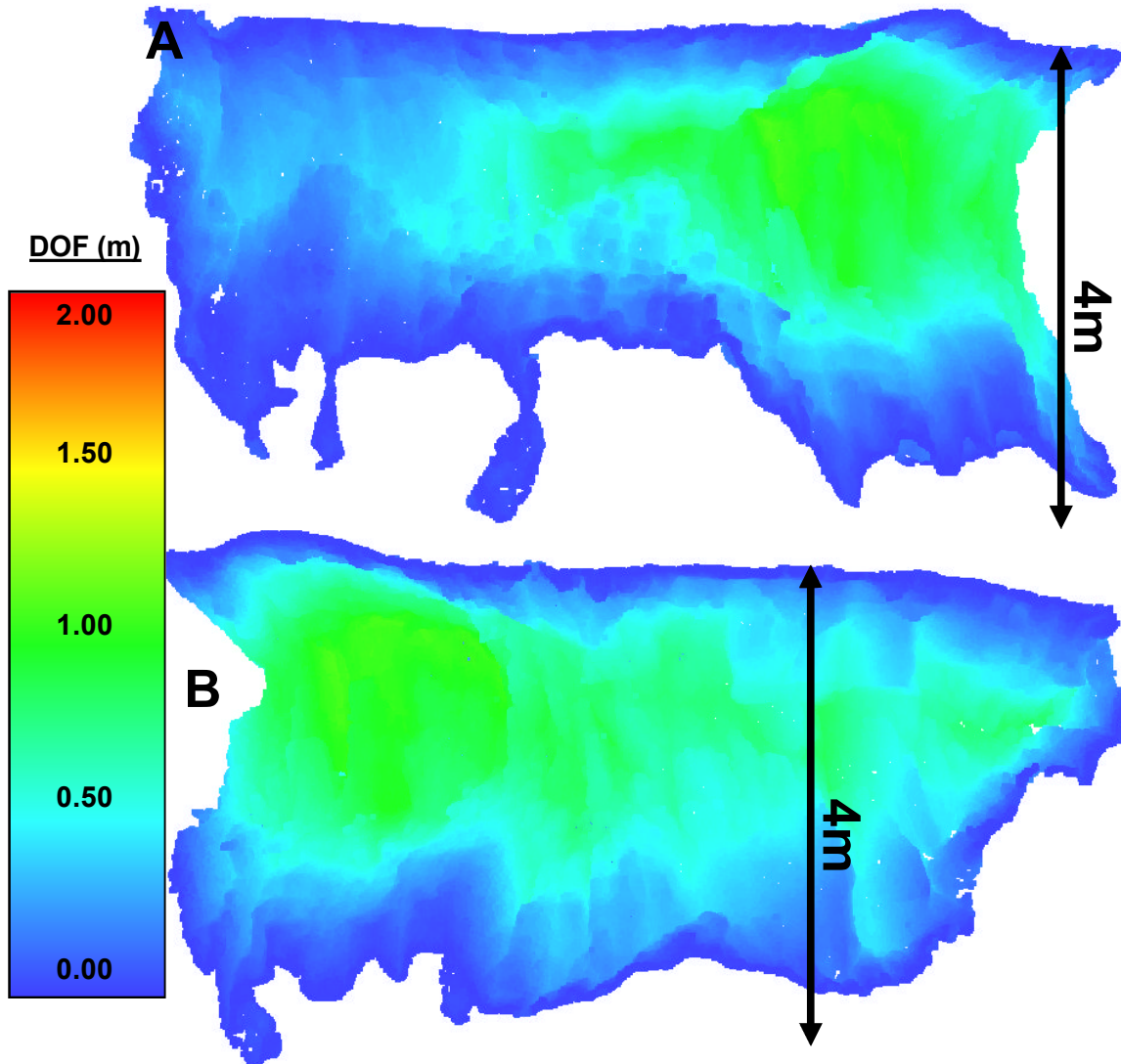


Figure D-28: Point Cloud of Pillar 2 with Depth of Failure Looking Southeast (A) and Northeast (B) – Epoch 5 Compared to Idealized Shell – Adjusted Average Depth of Failure = 0.44 m. NOTE: Scale is from 0 to 2 m. Failure Controlled by Sub-Vertical Joints. Intact Rock Fracture and Bedding Act as Horizontal Release. Advanced Hourglassing Defined by Intact Rock Fracture

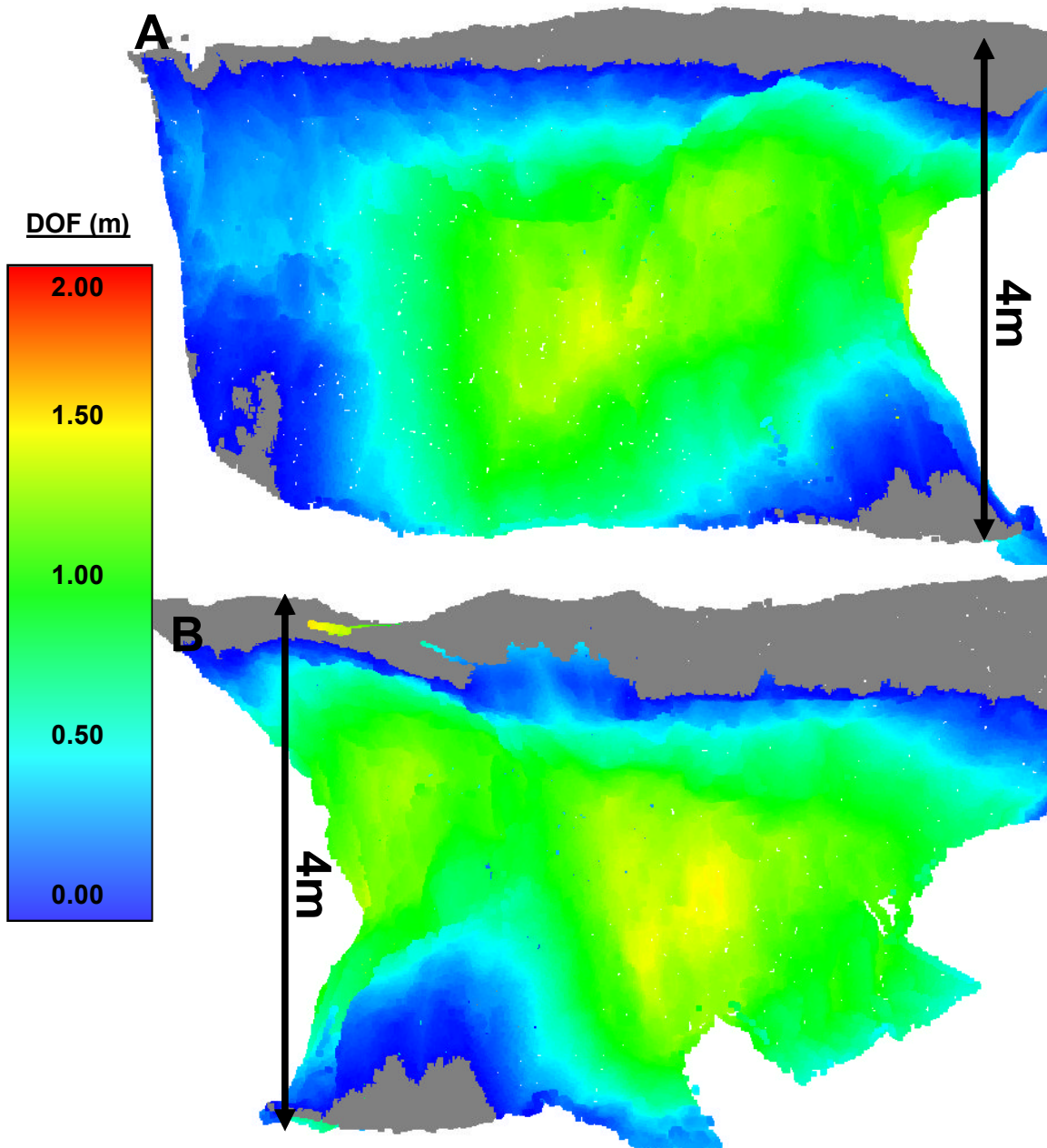


Figure D-29: Point Cloud of Pillar 2 with Depth of Failure Looking Southeast (A) and Northeast (B) – Epoch 51 Compared to Idealized Shell – Adjusted Average Depth of Failure = 0.64 m. NOTE: Scale is from 0 to 2 m. Failure Controlled by Sub-Vertical Joints. Intact Rock Fracture and Bedding Act as Horizontal Release. Advanced Hourglassing Defined by Intact Rock Fracture.

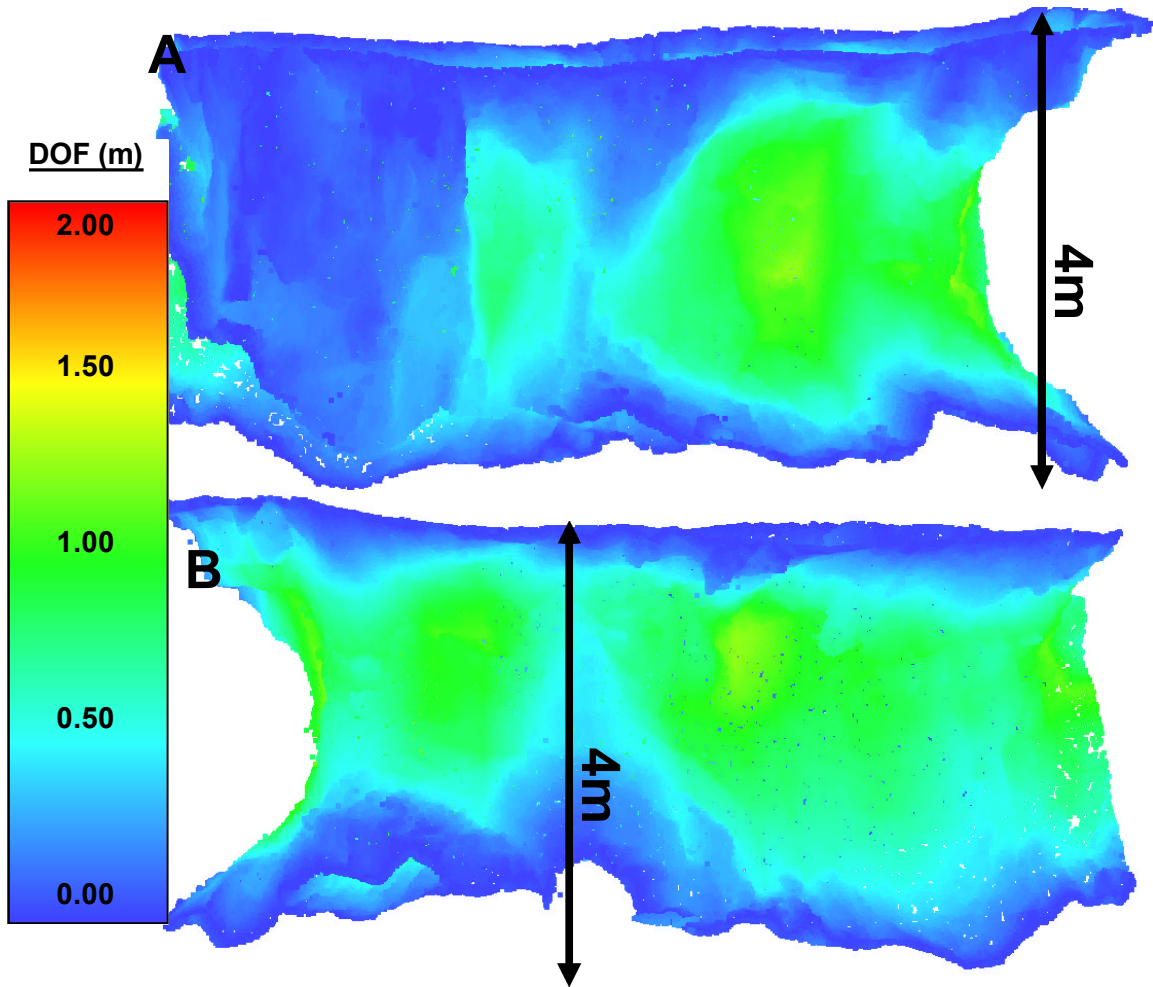


Figure D-30: Point Cloud of Pillar 3 with Depth of Failure Looking Southwest (A) and Northeast (B) – Epoch 5 Compared to Idealized Shell – Adjusted Average Depth of Failure = 0.47 m. NOTE: Scale is from 0 to 2 m. Failure Controlled by Sub-Vertical Joints. Intact Rock Fracture and Bedding Act as Horizontal Release. Advanced Hourglassing Defined by Intact Rock Fracture.

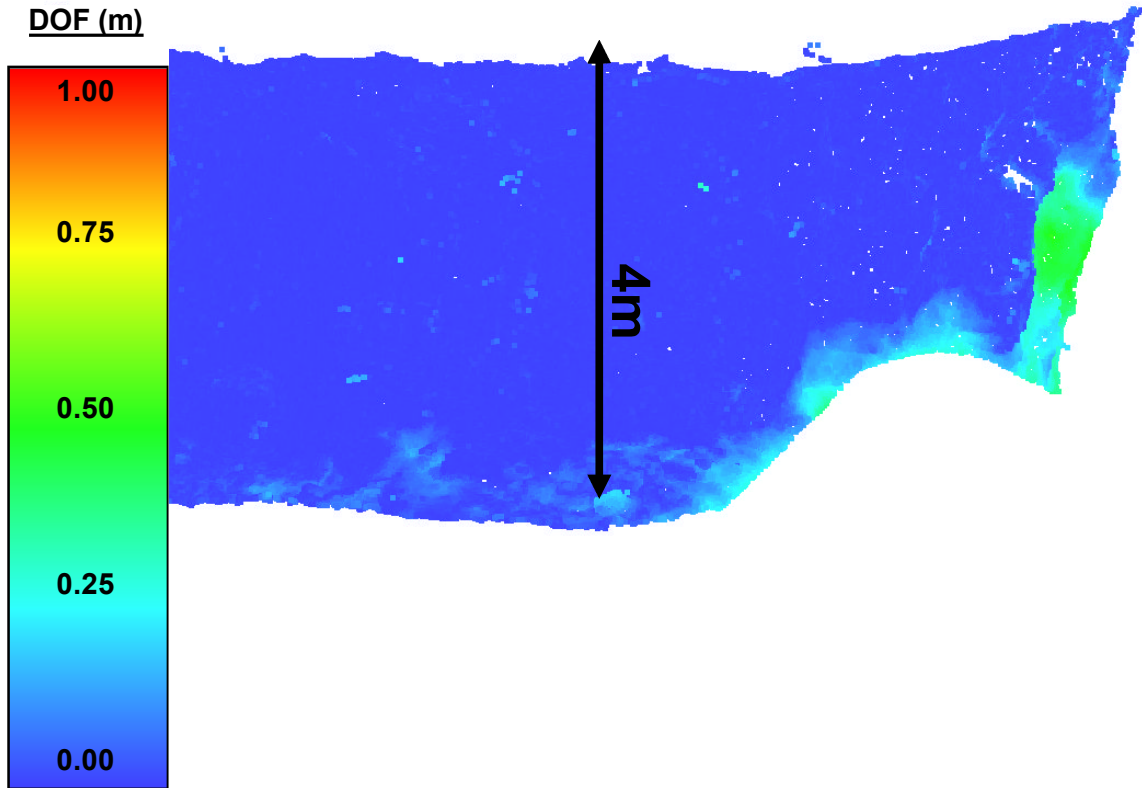


Figure D-31: Point Cloud of Pillar 4 with Depth of Failure Looking Northwest – Cumulative up to Epoch 83 – Adjusted Average Depth of Failure = 0.12 m. Failure Controlled by Sub-Vertical Joints. Intact Rock Fracture and Bedding Act as Horizontal Release.

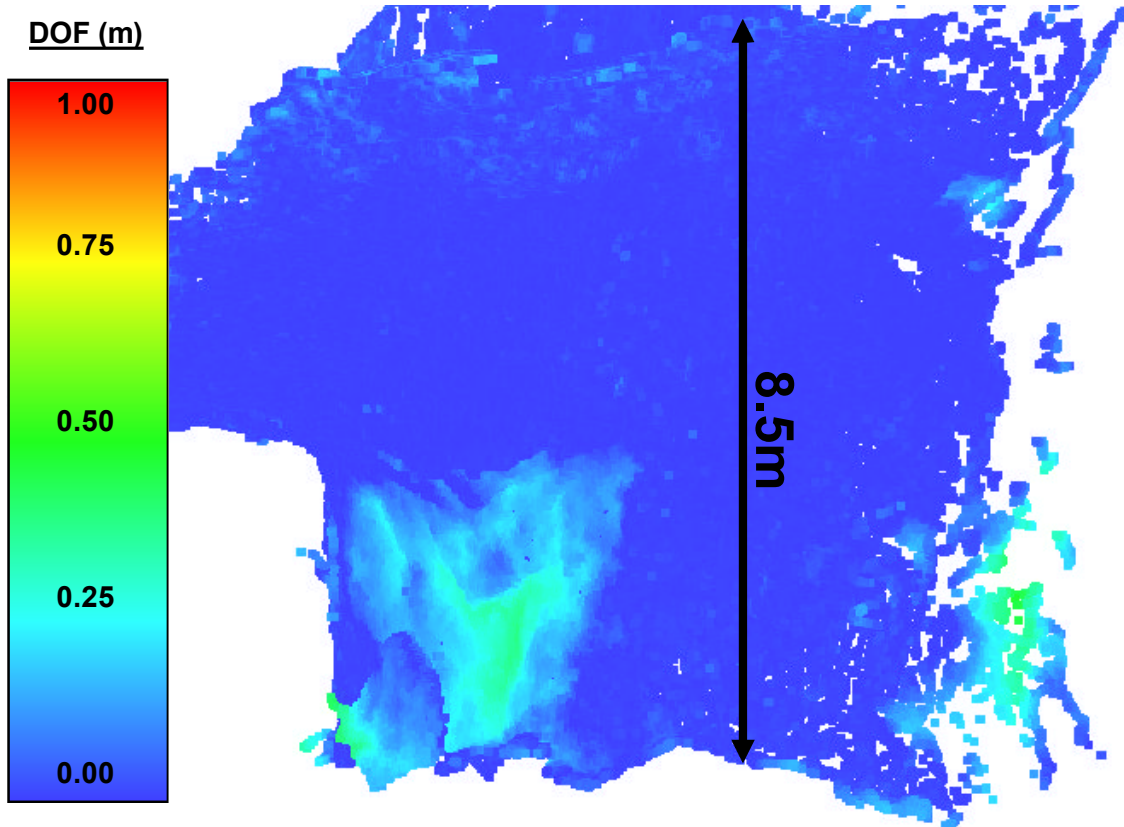


Figure D-32: Point Cloud of Pillar 5 with Depth of Failure Looking Southwest – Cumulative up to Epoch 57 – Adjusted Average Depth of Failure = 0.04 m. Failure Controlled by Set 1a and Intact Fracture. Bedding acts as Horizontal Release on Top Surfaces

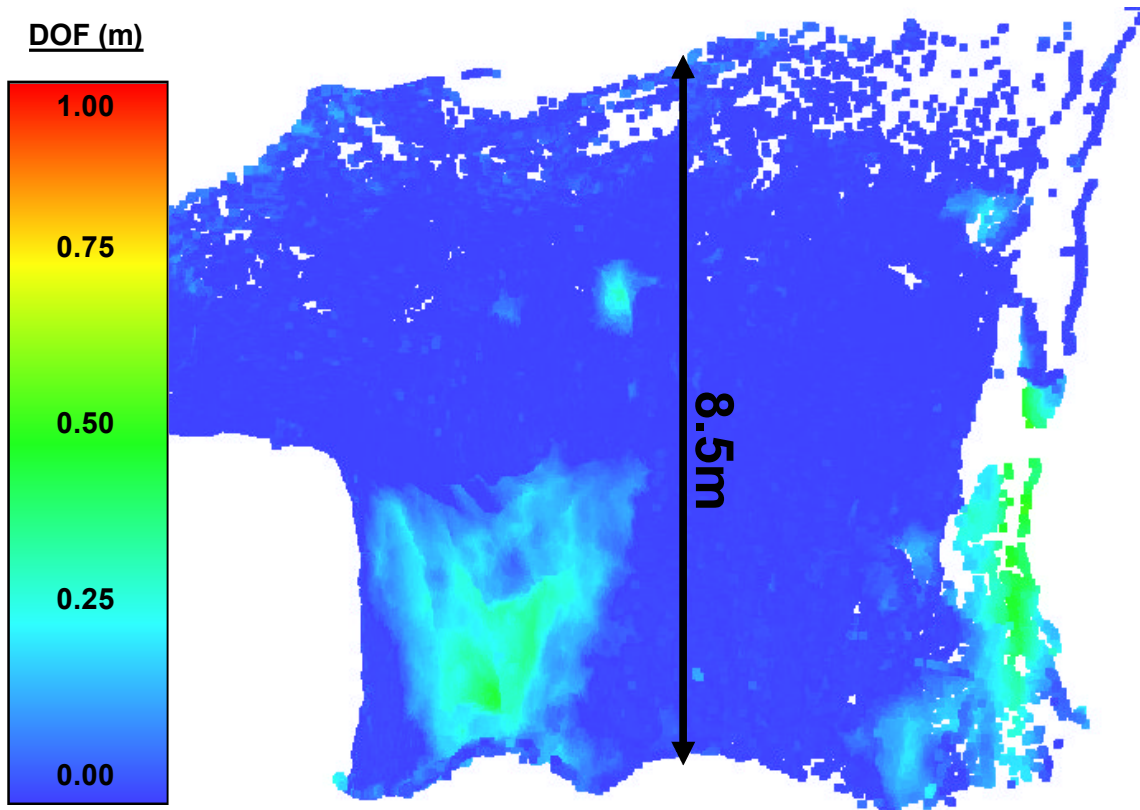


Figure D-33: Point Cloud of Pillar 5 with Depth of Failure Looking Southwest – Cumulative up to Epoch 83 – Adjusted Average Depth of Failure = 0.06 m. Failure Controlled by Set 1a and Intact Fracture. Bedding acts as Horizontal Release on Top Surfaces

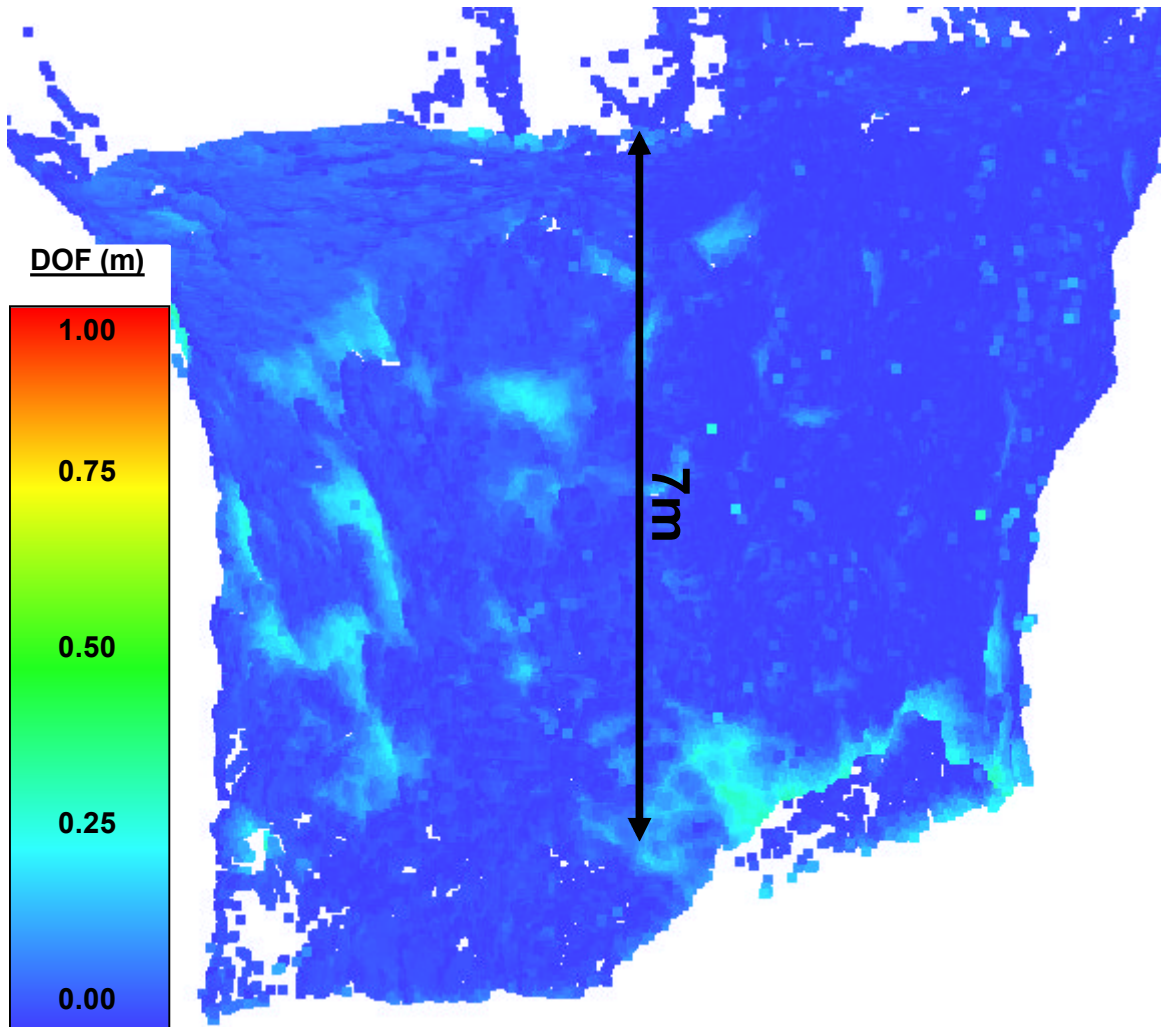


Figure D-34: Point Cloud of Pillar 6 with Depth of Failure Looking Northeast – Cumulative up to Epoch 57 – Adjusted Average Depth of Failure = 0.06 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

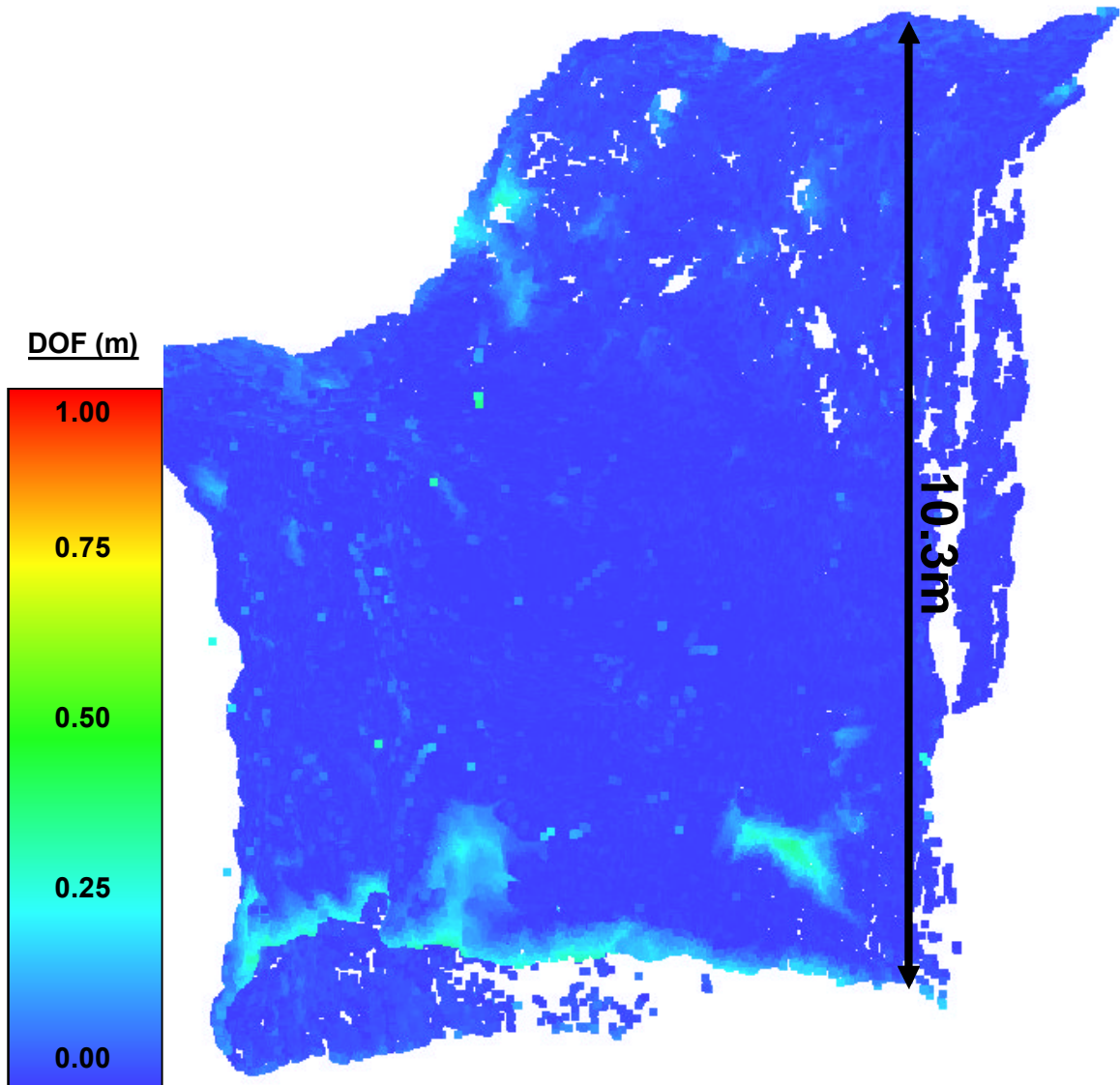


Figure D-35: Point Cloud of Pillar 6 with Depth of Failure Looking Northwest – Cumulative up to Epoch 57 – Adjusted Average Depth of Failure = 0.06 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

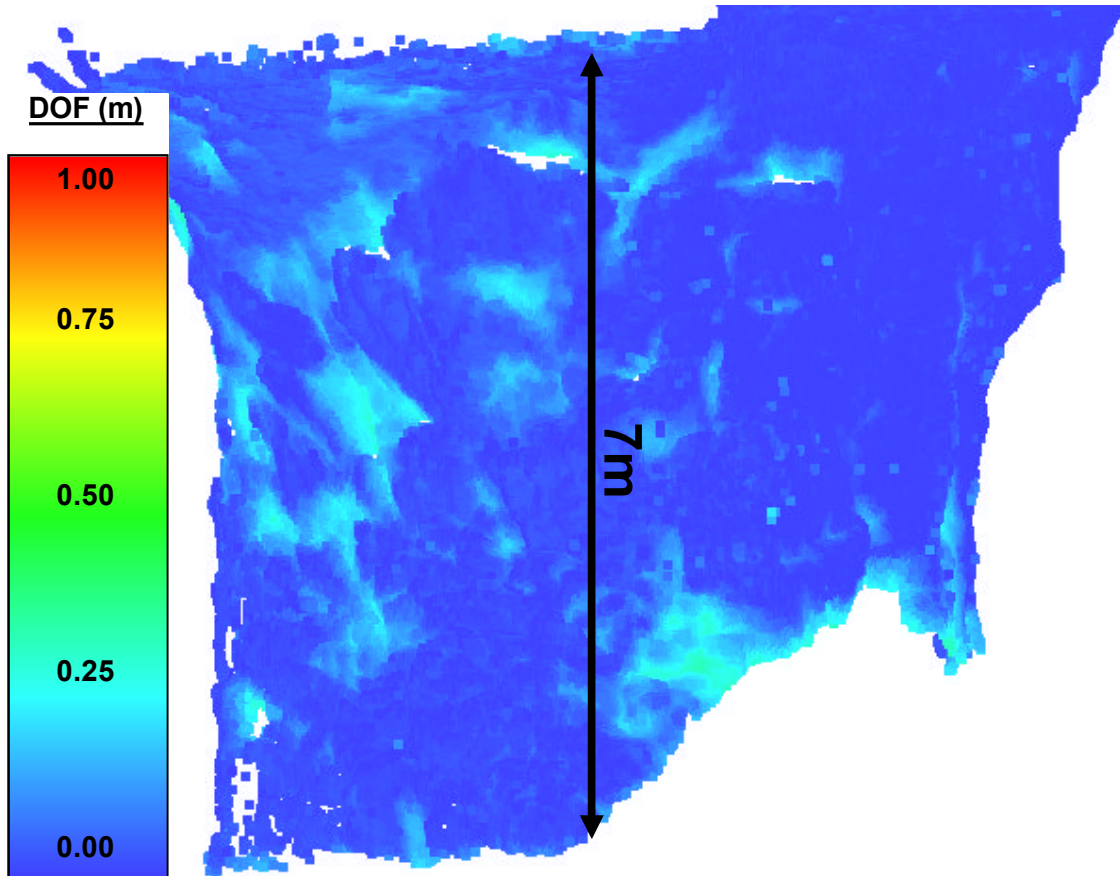


Figure D-36: Point Cloud of Pillar 6 with Depth of Failure Looking Northeast – Cumulative up to Epoch 83 – Adjusted Average Depth of Failure = 0.07 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

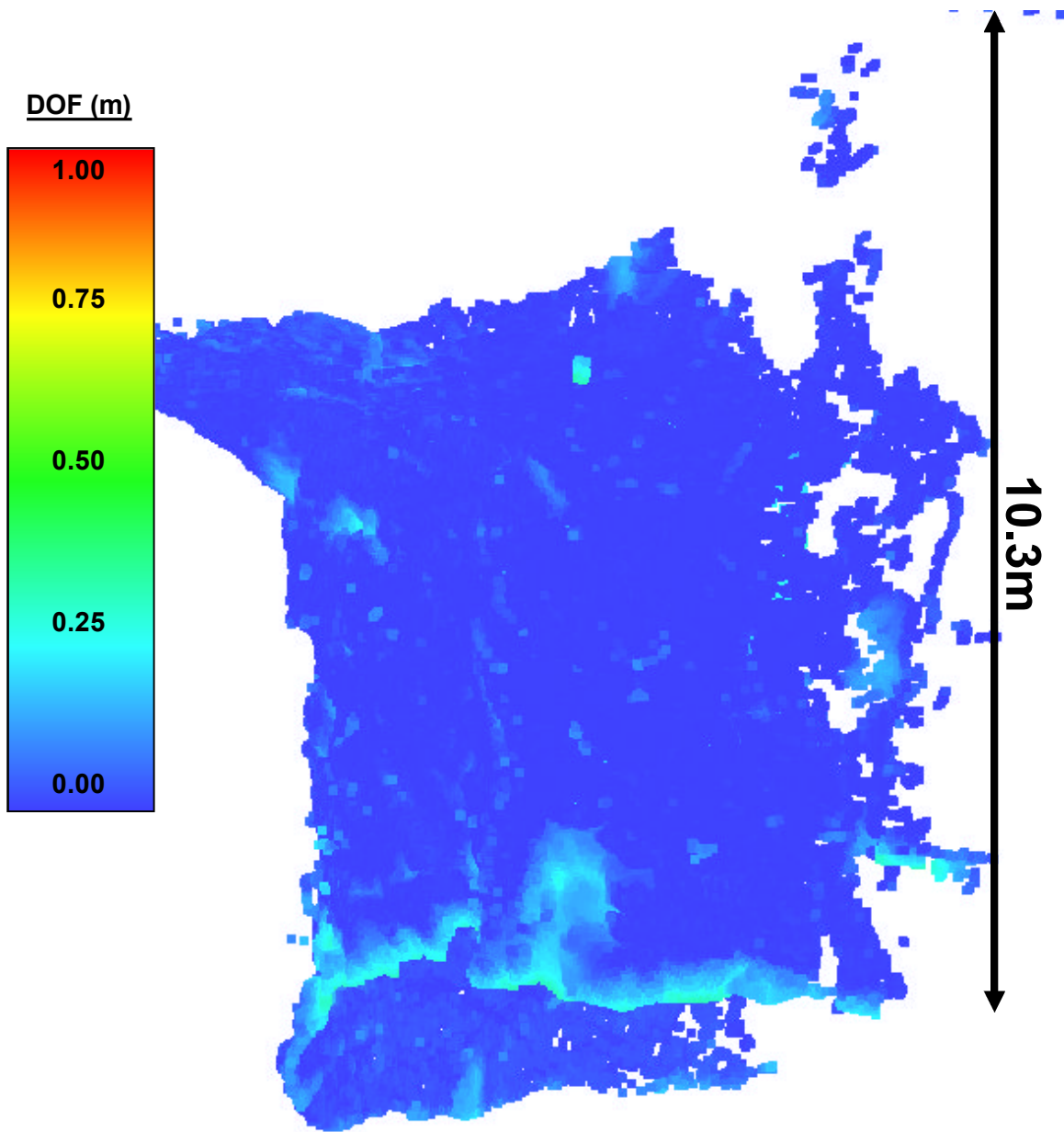


Figure D-37: Point Cloud of Pillar 6 with Depth of Failure Looking Northwest – Cumulative up to Epoch 83 – Adjusted Average Depth of Failure = 0.07 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

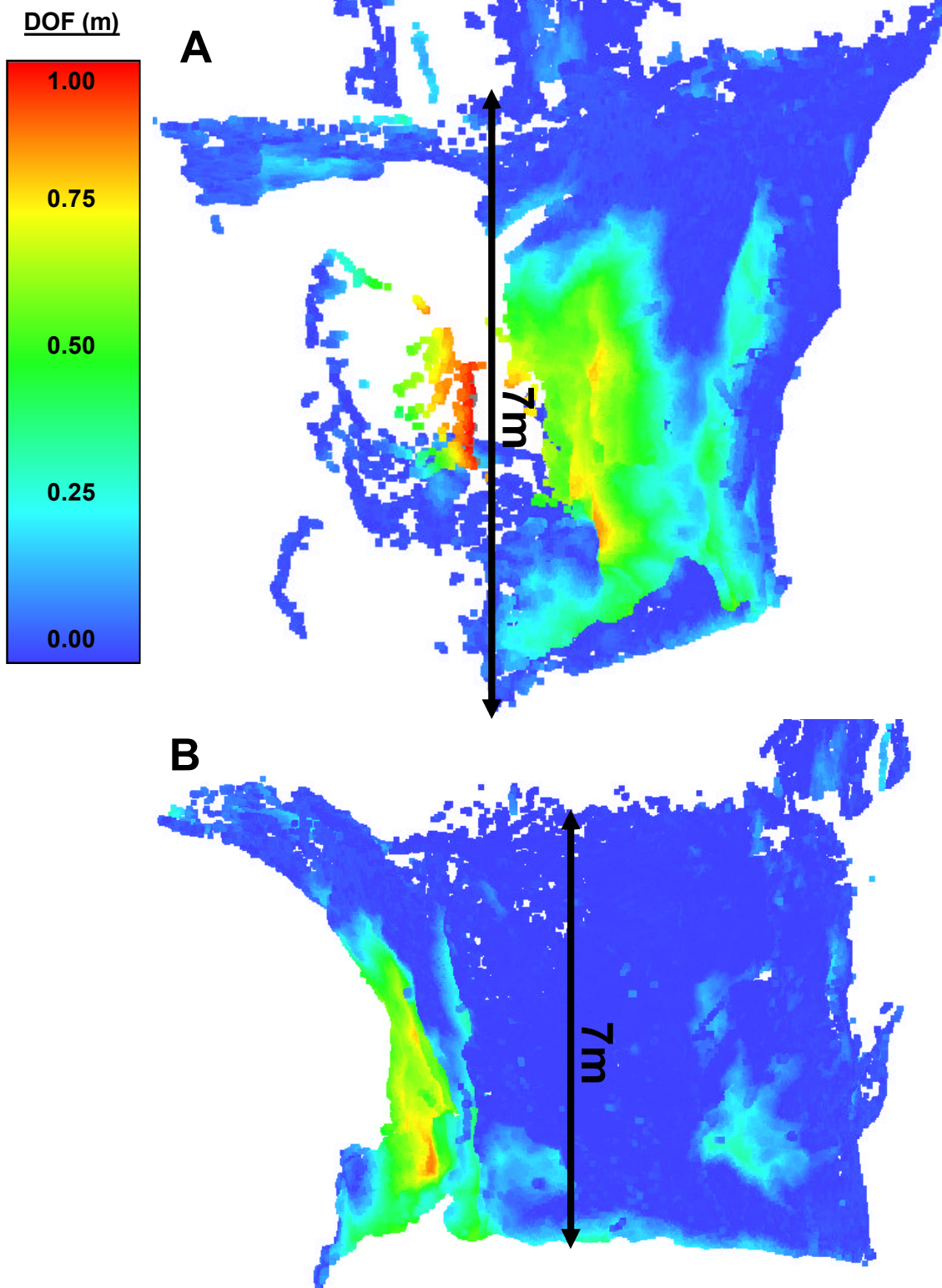


Figure D-38: Point Cloud of Pillar 6 with Depth of Failure Looking Northeast (A) and Northwest (B) – Cumulative up to Epoch 230 – Adjusted Average Depth of Failure = 0.16 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

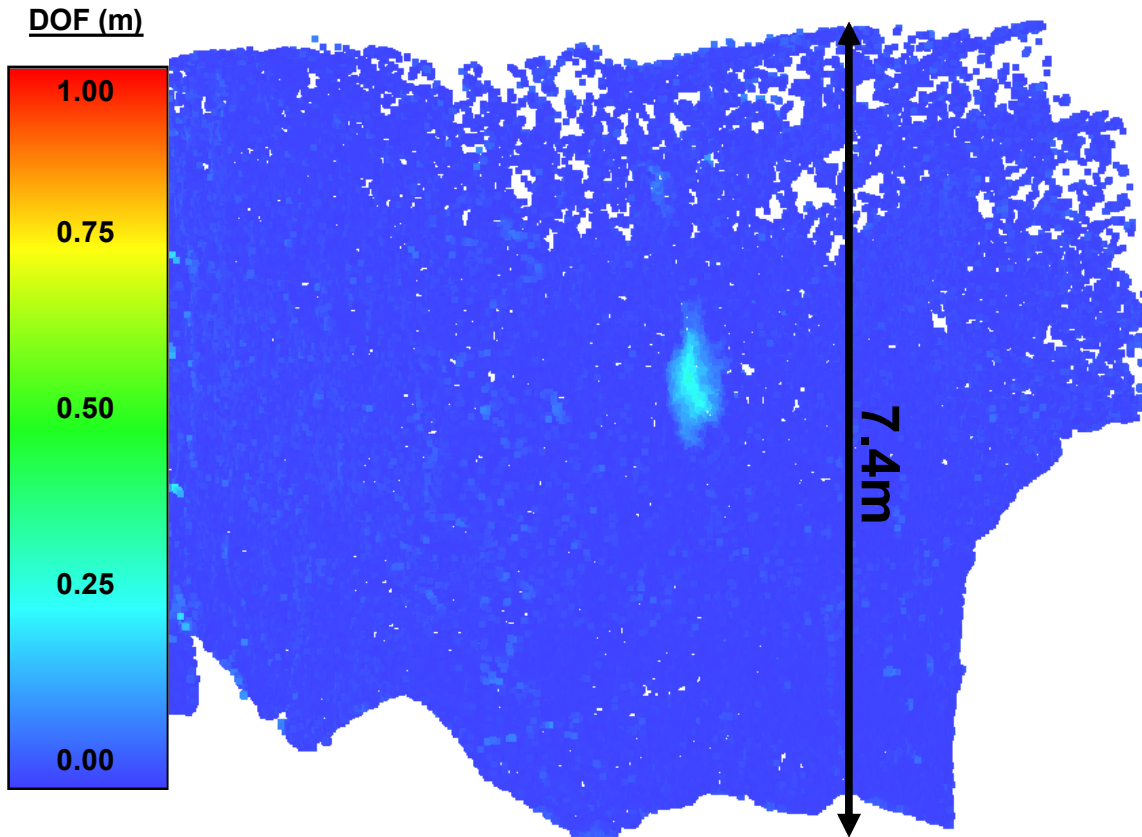


Figure D-39: Point Cloud of Pillar 7 with Depth of Failure Looking Southwest – Cumulative up to Epoch 230 – Adjusted Average Depth of Failure = 0.03 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

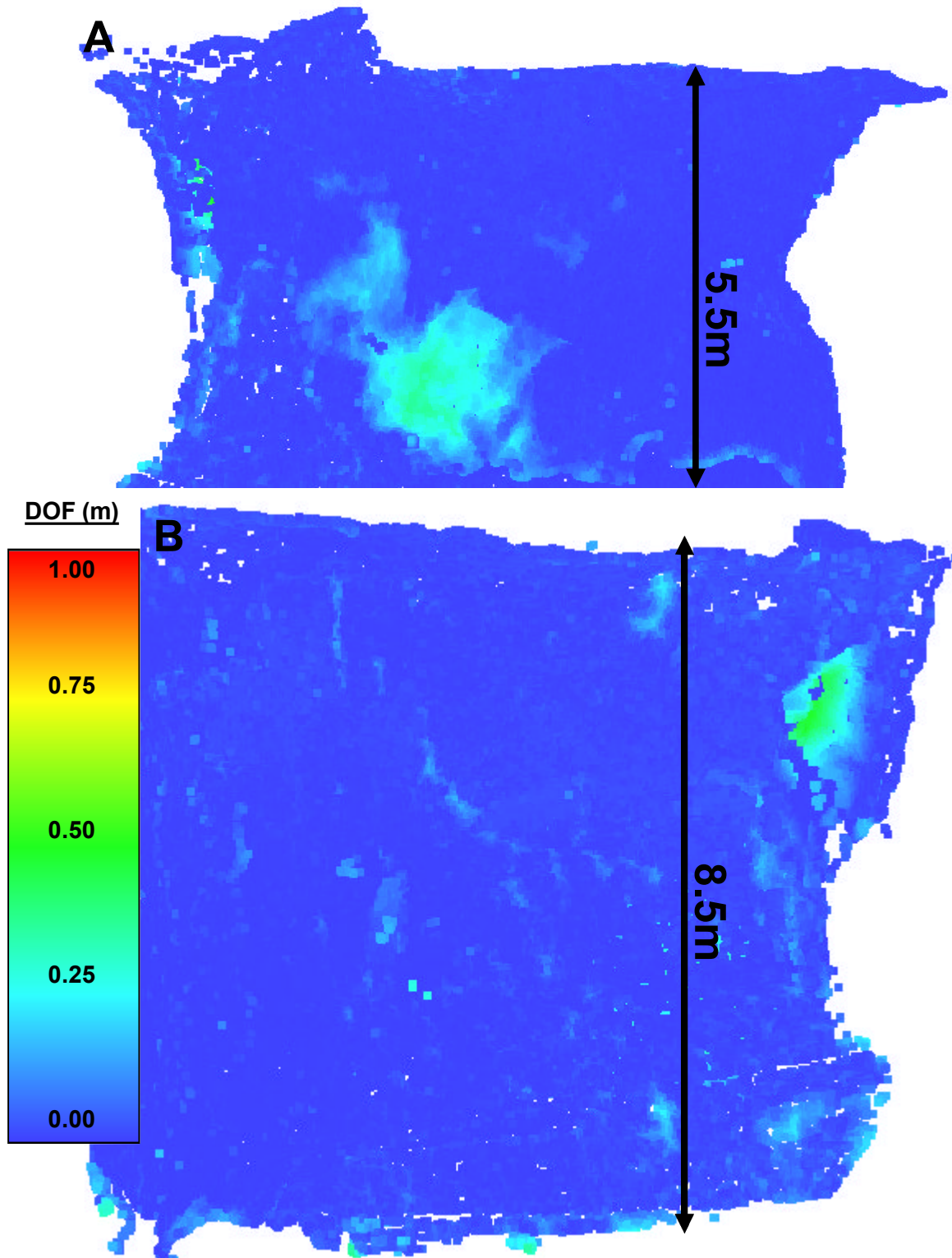


Figure D-40: Point Cloud of Pillar 8 with Depth of Failure Looking Southwest (A) and North (B) – Cumulative up to Epoch 83 – Adjusted Average Depth of Failure = 0.05 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

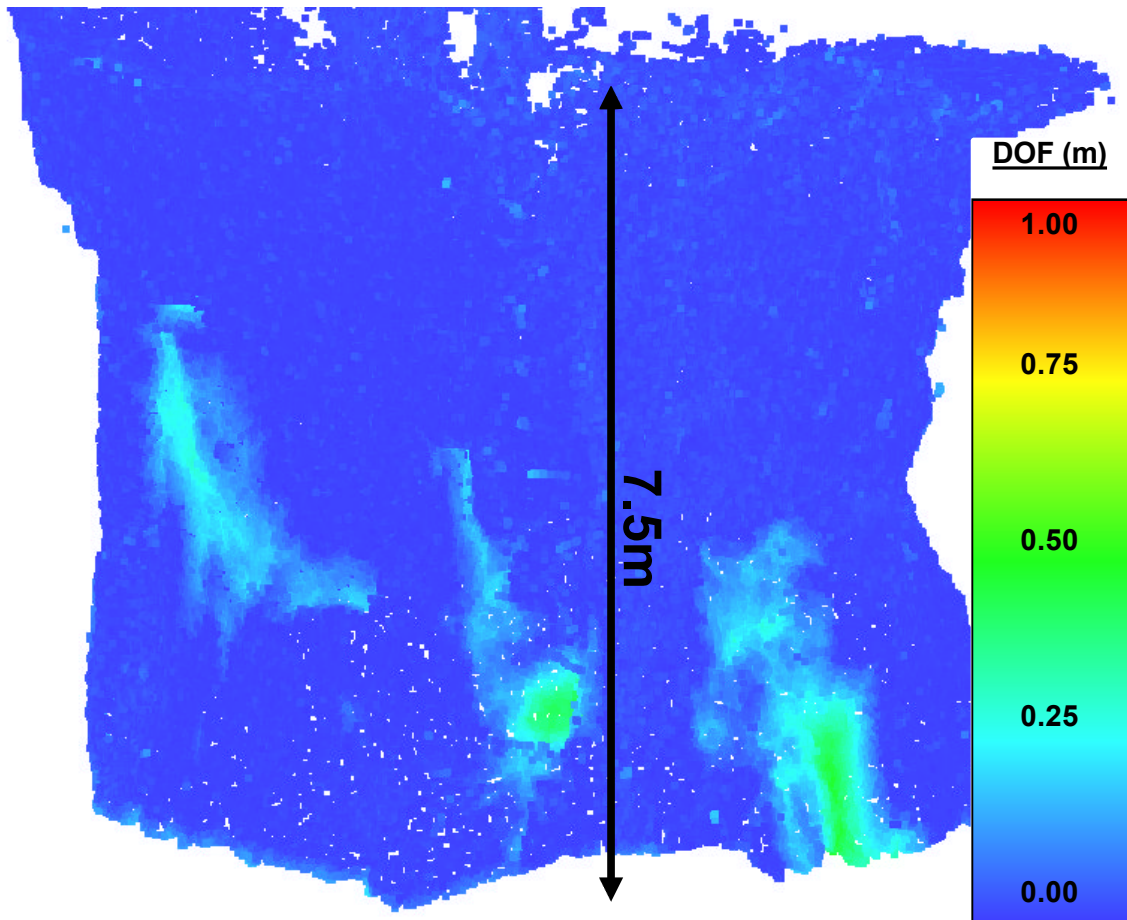


Figure D-41: Point Cloud of Pillar 9 with Depth of Failure Looking Northeast – Cumulative up to Epoch 230 – Adjusted Average Depth of Failure = 0.07 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

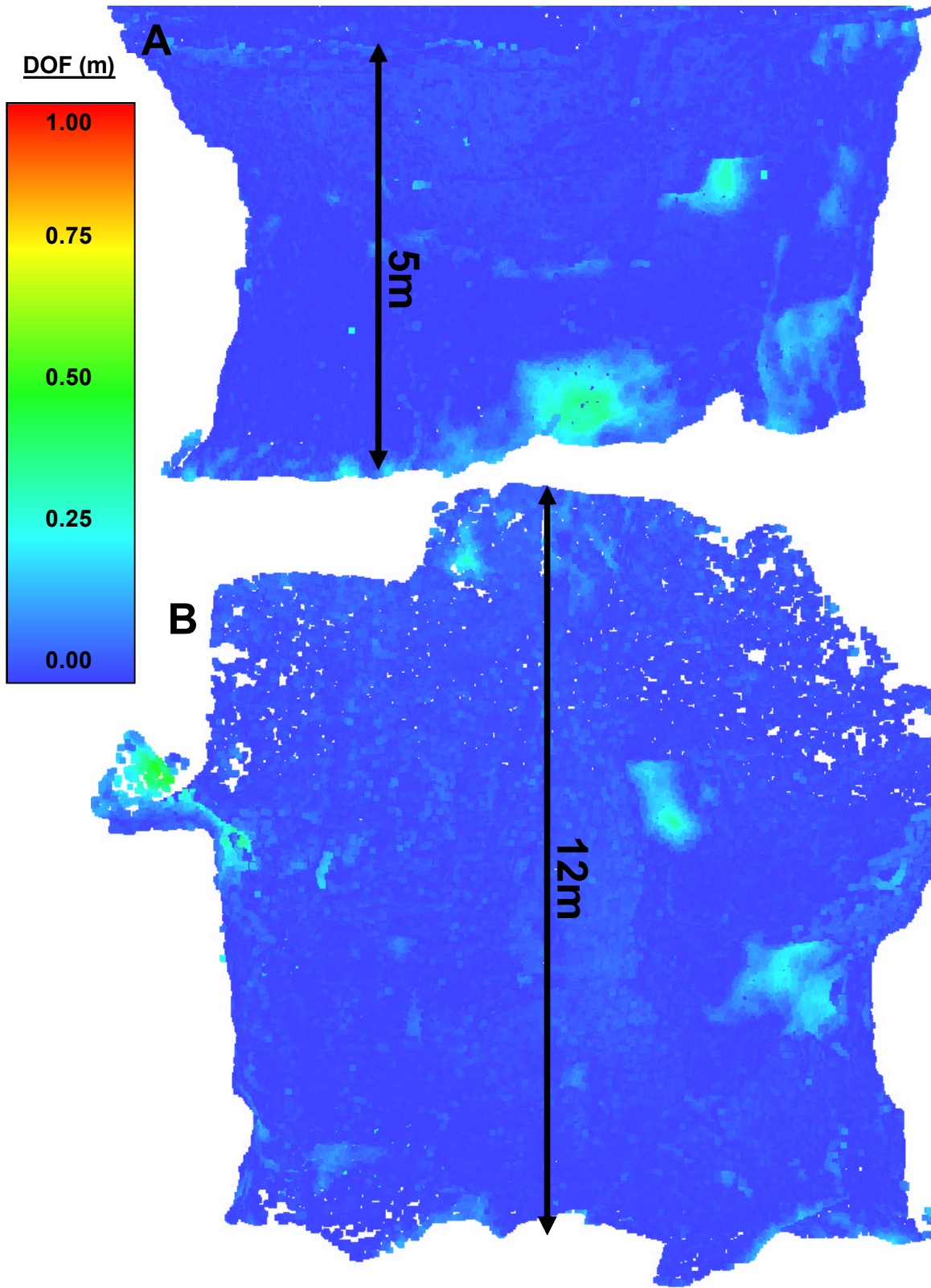


Figure D-42: Point Cloud of Pillar 10 with Depth of Failure Looking Northeast (A) and South (B) – Cumulative up to Epoch 230 – Adjusted Average Depth of Failure = 0.06 m. Failure Controlled by Sub-Vertical Joints. Bedding acts as Horizontal Release.

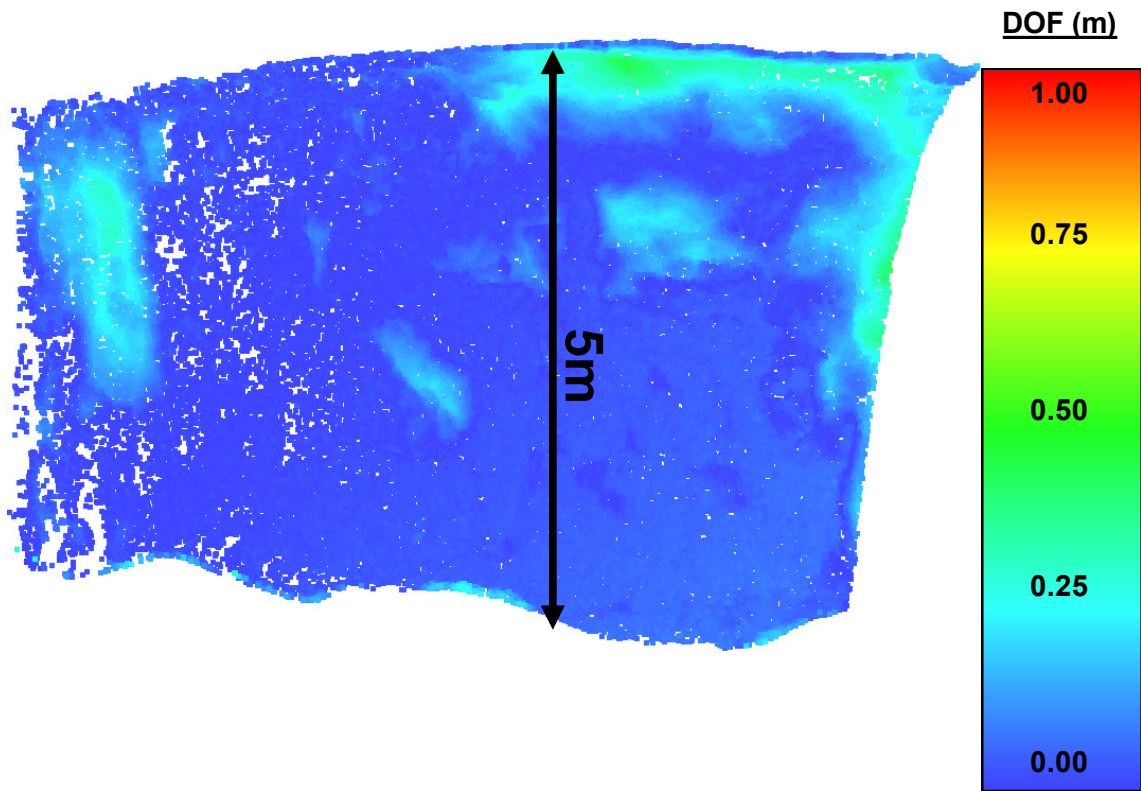


Figure D-43: Point Cloud of Pillar 11 with Depth of Failure Looking Southwest – Cumulative up to Epoch 49 – Adjusted Average Depth of Failure = 0.07 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

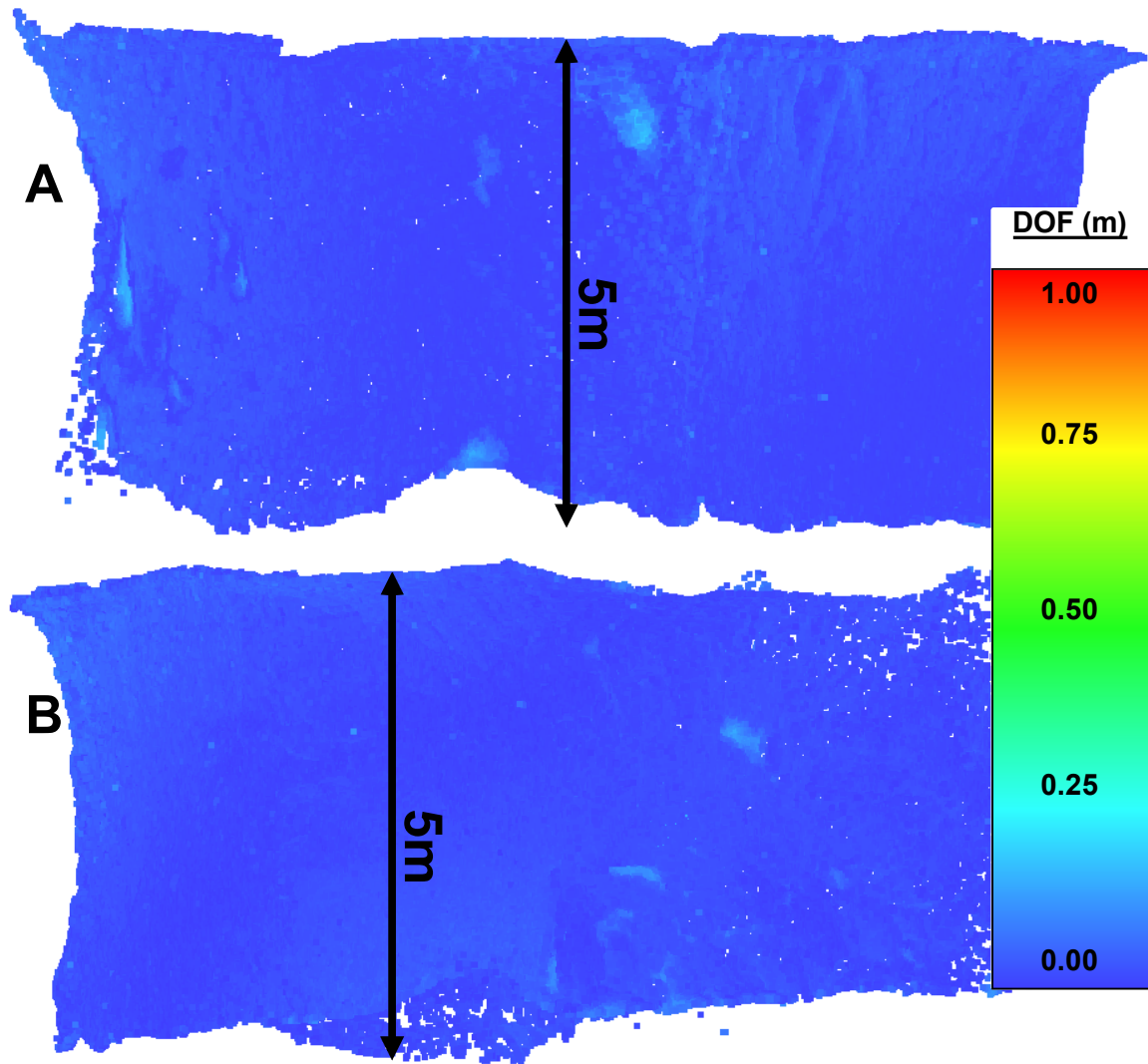


Figure D-44: Point Cloud of Pillar 12 with Depth of Failure Looking West (A) and South (B) – Cumulative up to Epoch 49 – Adjusted Average Depth of Failure = 0.04 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

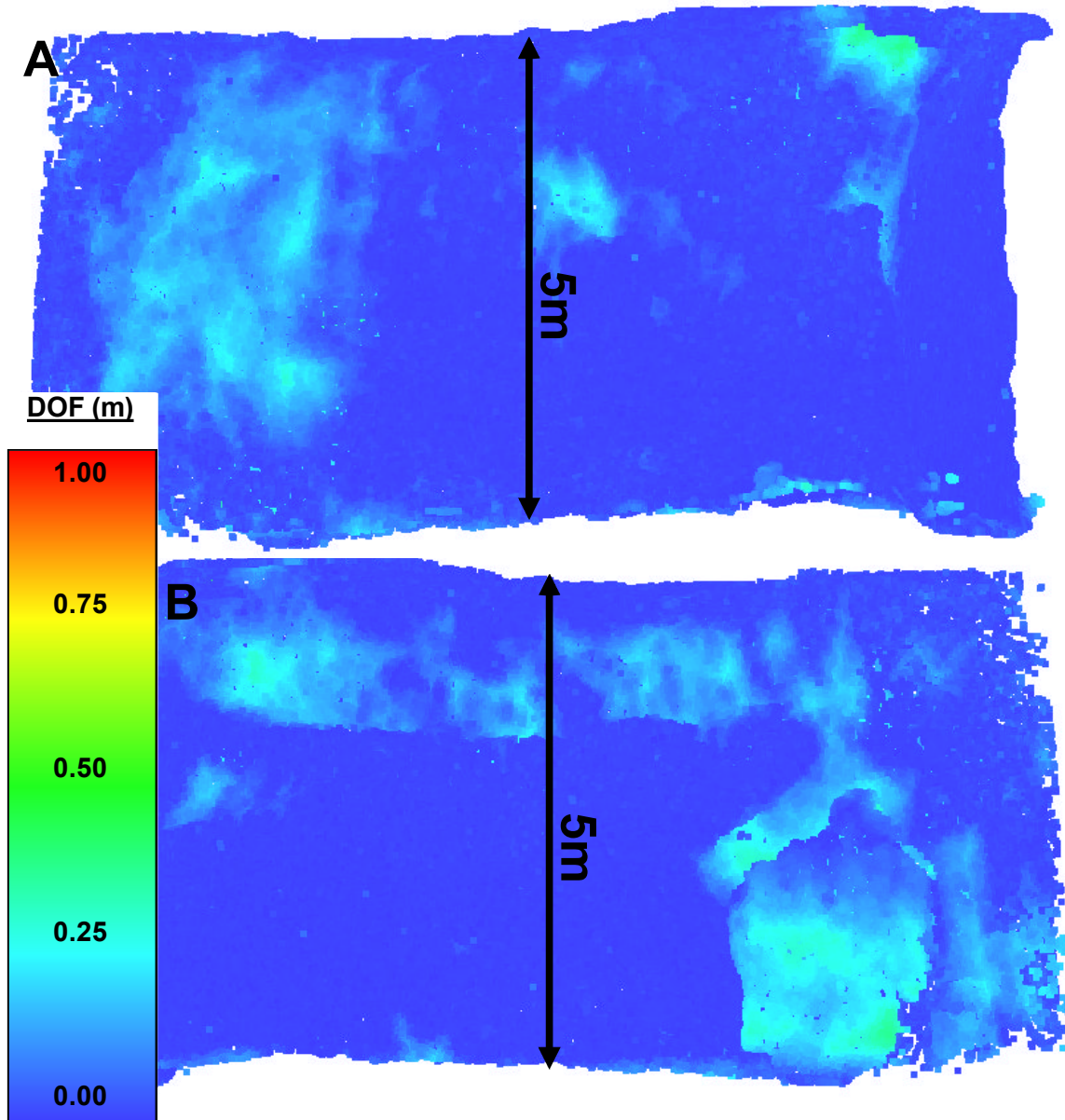


Figure D-45: Point Cloud of Pillar 13 with Depth of Failure Looking Northwest (A) and Southeast (B) – Cumulative up to Epoch 49 – Adjusted Average Depth of Failure = 0.06 m. Failure Controlled by Sub-Vertical Joints but Often Difficult to Observe. Horizontal Release is Often through Intact Fracture.

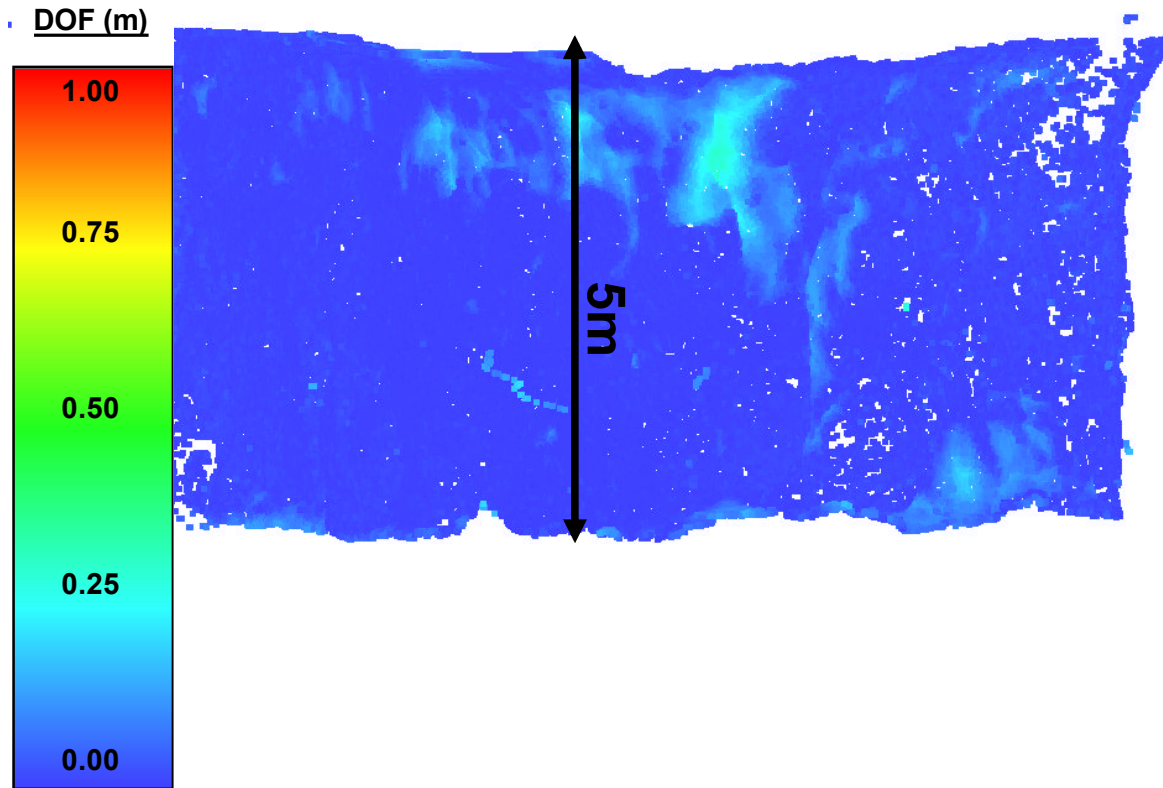


Figure D-46: Point Cloud of Pillar 14 with Depth of Failure Looking South – Cumulative up to Epoch 58 – Adjusted Average Depth of Failure = 0.04 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

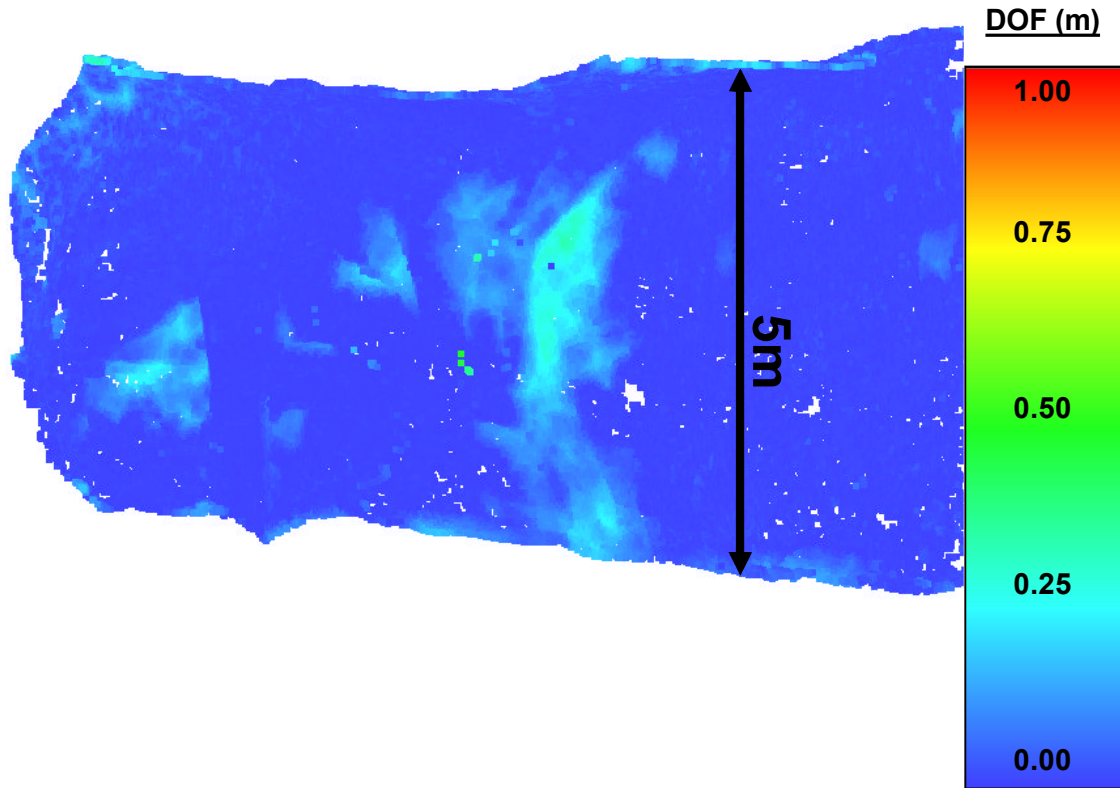


Figure D-47: Point Cloud of Pillar 15 with Depth of Failure Looking East – Cumulative up to Epoch 58 – Adjusted Average Depth of Failure = 0.03 m. Failure Controlled by Sub-Vertical Joints but Often Forming Very Rough Surfaces. Horizontal Release is Often through Intact Fracture.

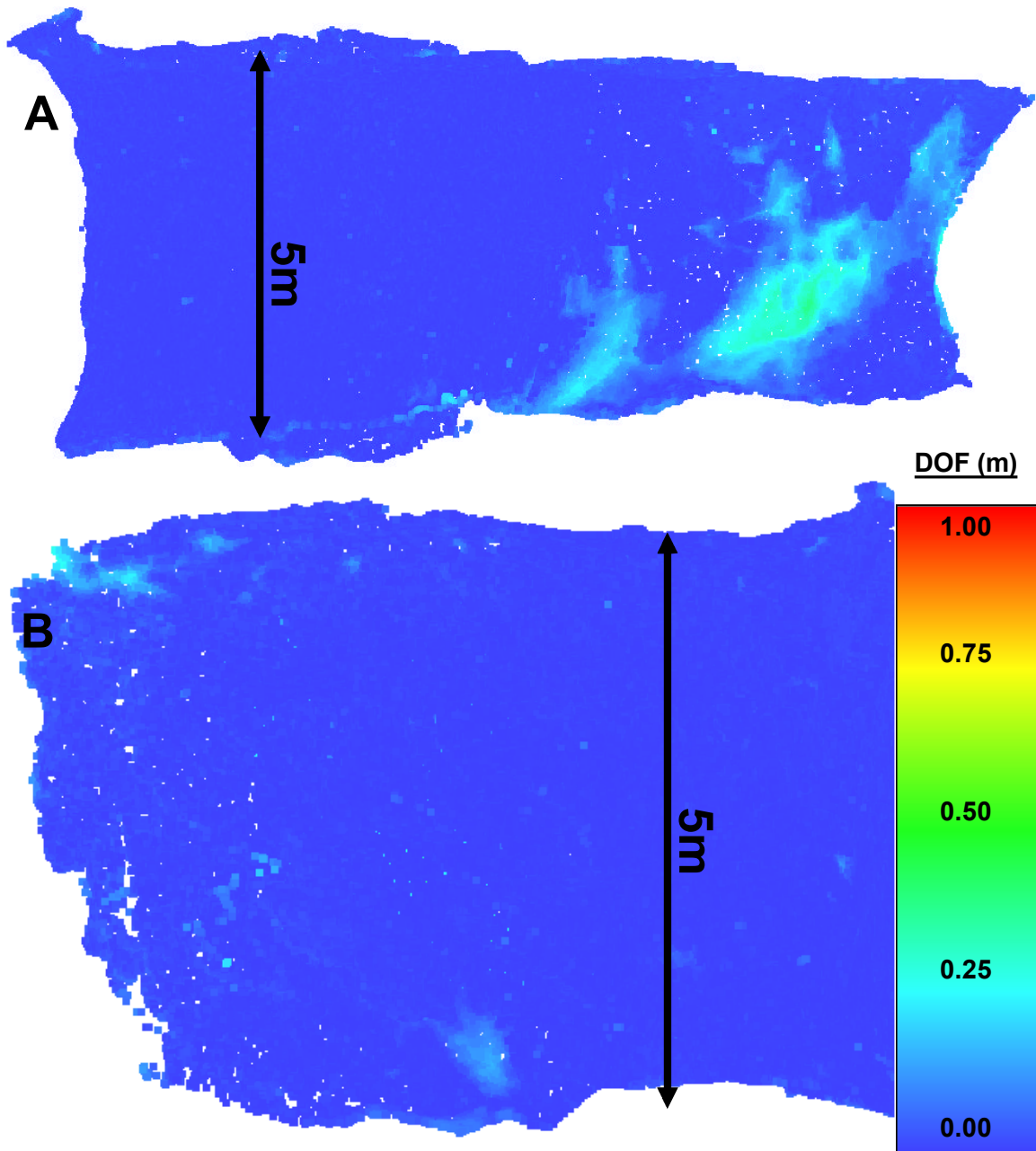


Figure D-48: Point Cloud of Pillar 16 with Depth of Failure Looking North (A) and Southeast (B) – Cumulative up to Epoch 58 – Adjusted Average Depth of Failure = 0.04 m. Failure Controlled by Set 2b Forming Blocks with Set 1b or Intact Fracture. Horizontal Release is Often Through Intact Fracture.

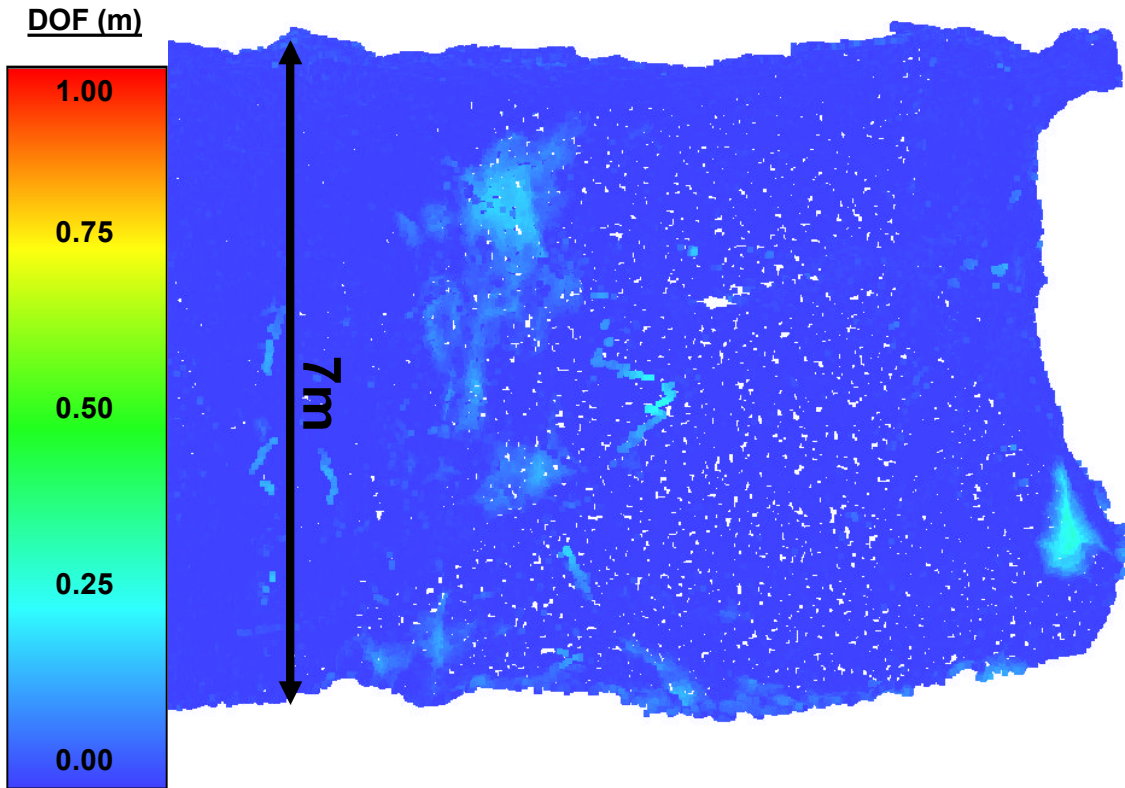


Figure D-49: Point Cloud of Pillar 17 with Depth of Failure Looking Northwest – Cumulative up to Epoch 113 – Adjusted Average Depth of Failure = 0.08 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

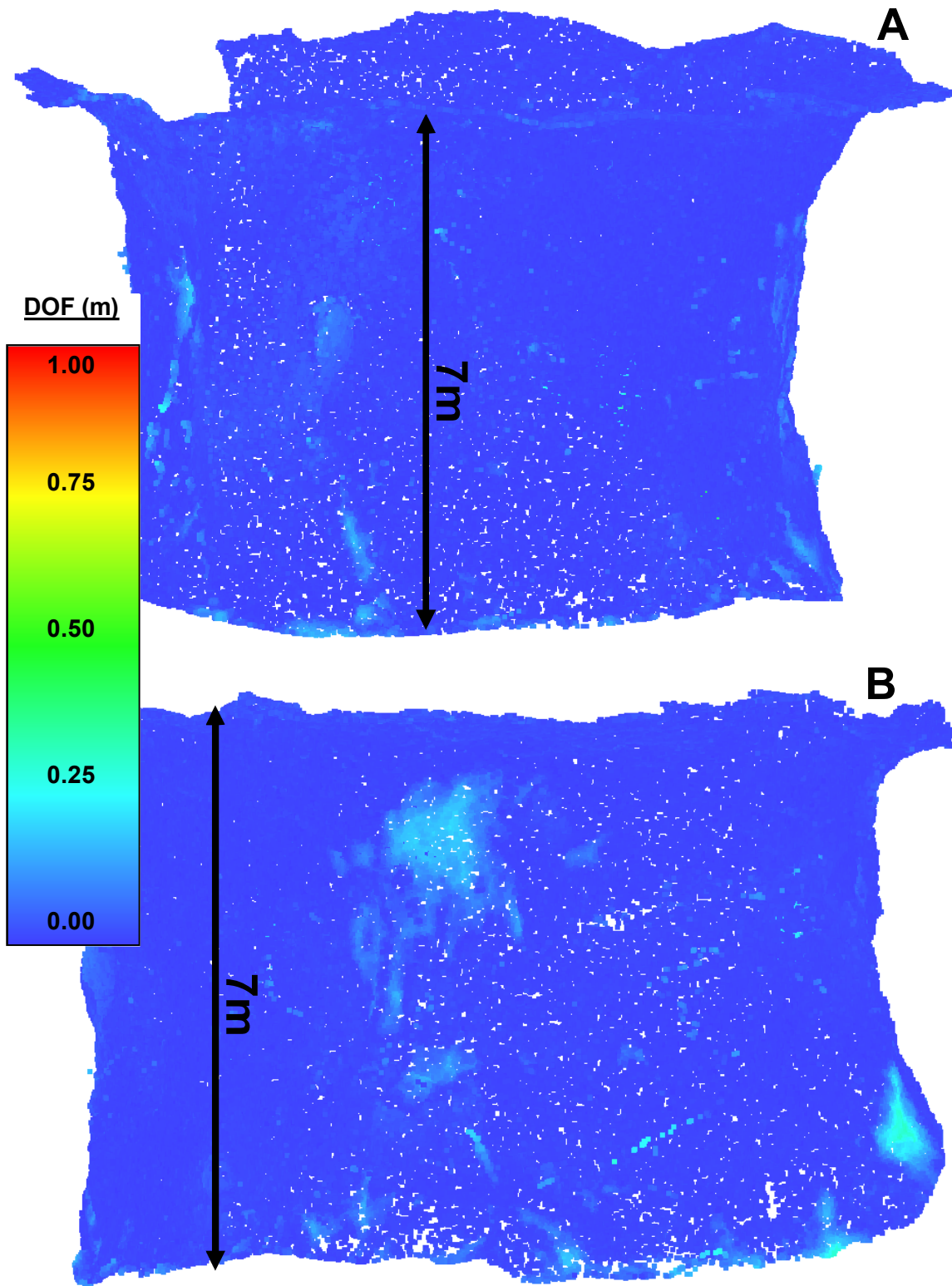


Figure D-50: Point Cloud of Pillar 17 with Depth of Failure Looking Northeast (A) and Northwest (B) – Cumulative up to Epoch 168 – Adjusted Average Depth of Failure = 0.09 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

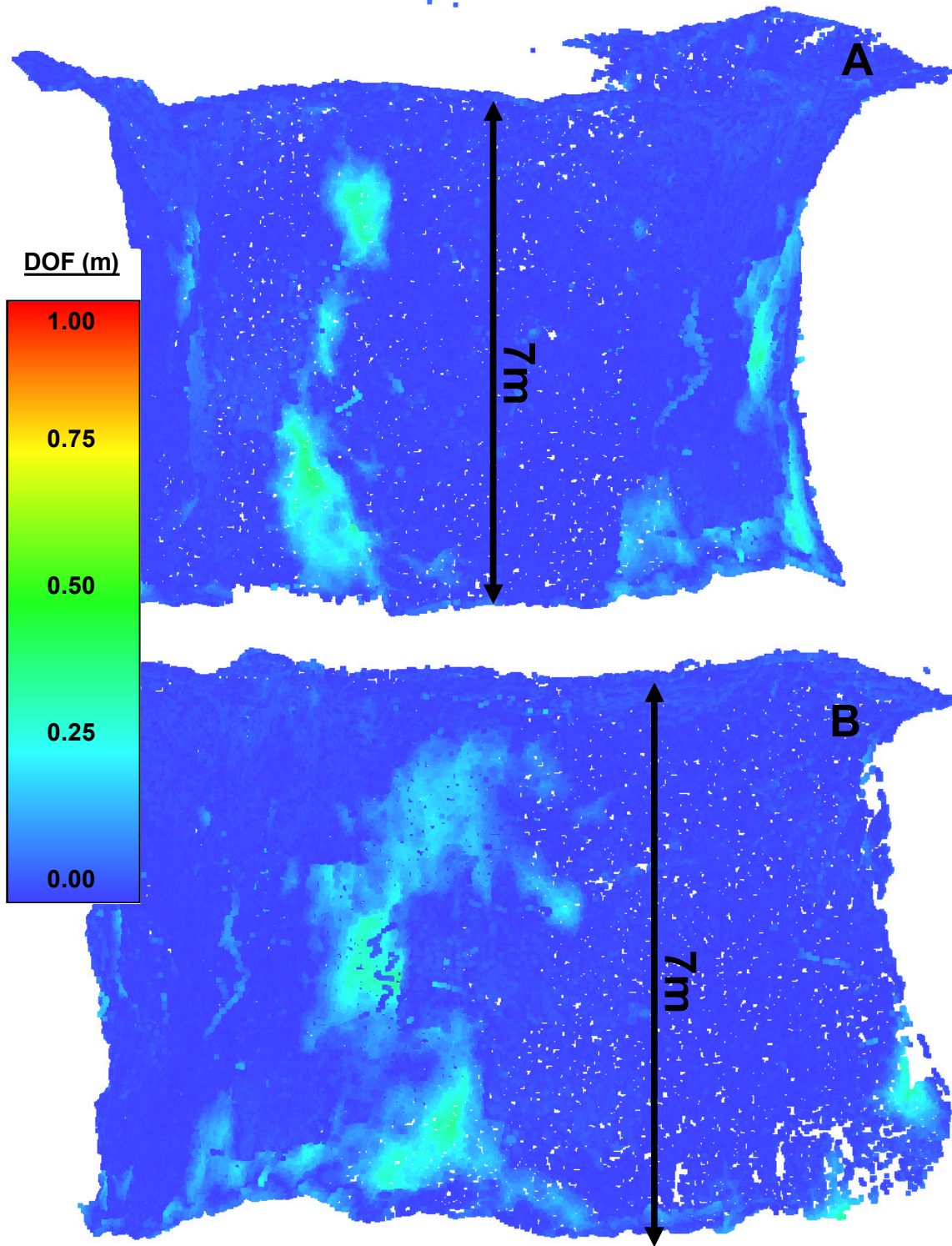


Figure D-51: Point Cloud of Pillar 17 with Depth of Failure Looking Northeast (A) and Northwest (B)– Cumulative up to Epoch 196 – Adjusted Average Depth of Failure = 0.11 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

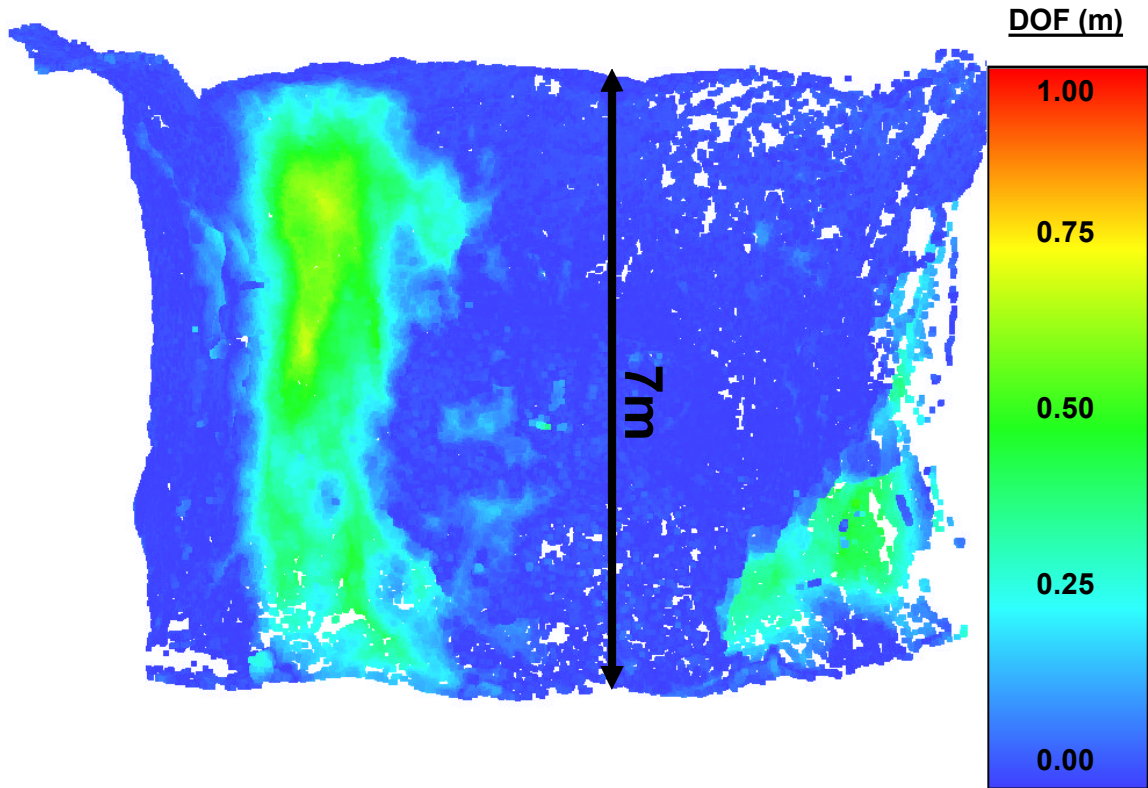


Figure D-52: Point Cloud of Pillar 17 with Depth of Failure Looking Northeast – Cumulative up to Epoch 208 – Adjusted Average Depth of Failure = 0.17 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

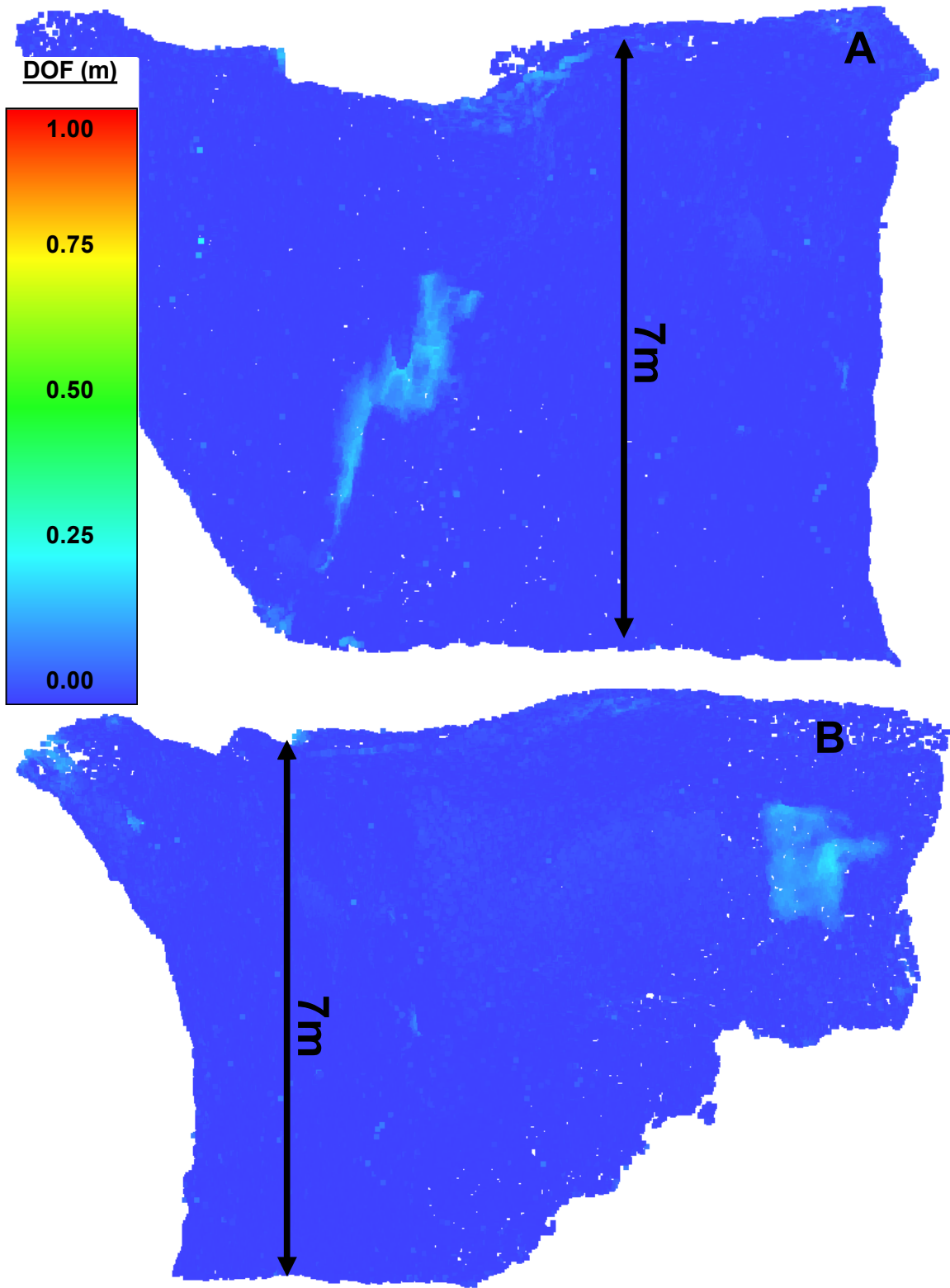


Figure D-53: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest (A) and Southwest (B) – Cumulative up to Epoch 49 – Adjusted Average Depth of Failure = 0.11 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

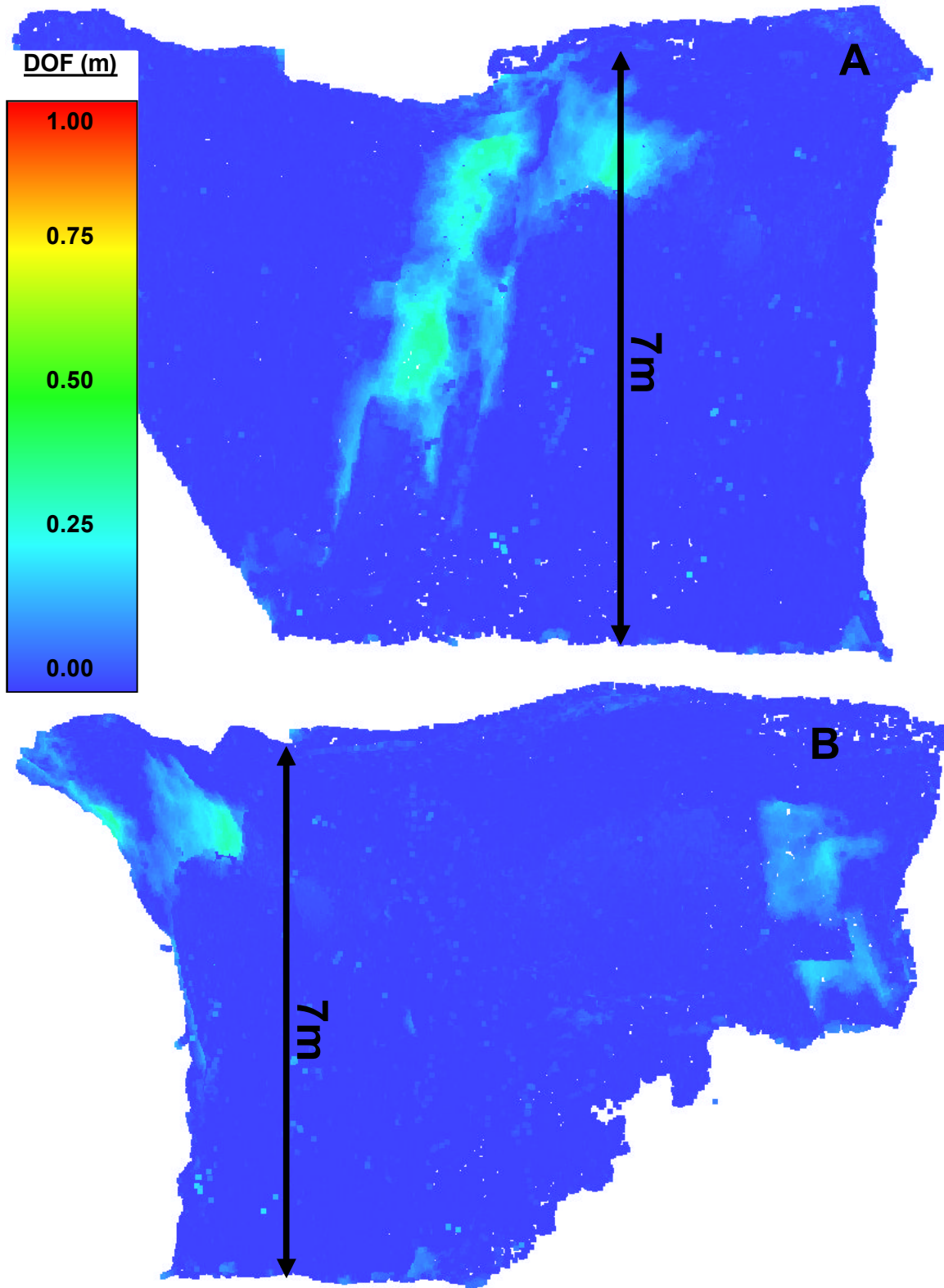


Figure D-54: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest (A) and Southwest (B) – Cumulative up to Epoch 58 – Adjusted Average Depth of Failure = 0.13 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

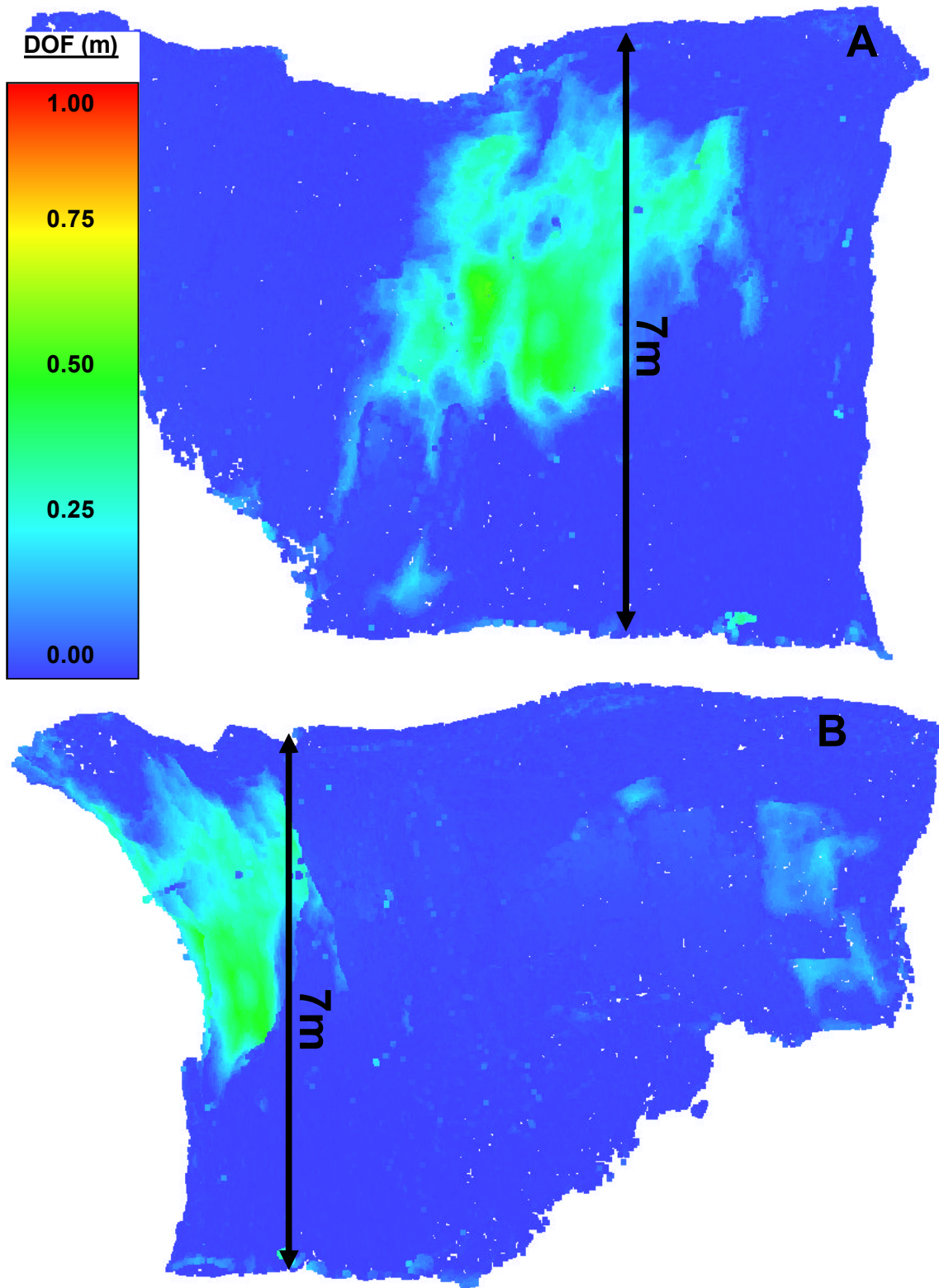


Figure D-55: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest A) and Southwest (B)– Cumulative up to Epoch 84 – Adjusted Average Depth of Failure = 0.16 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

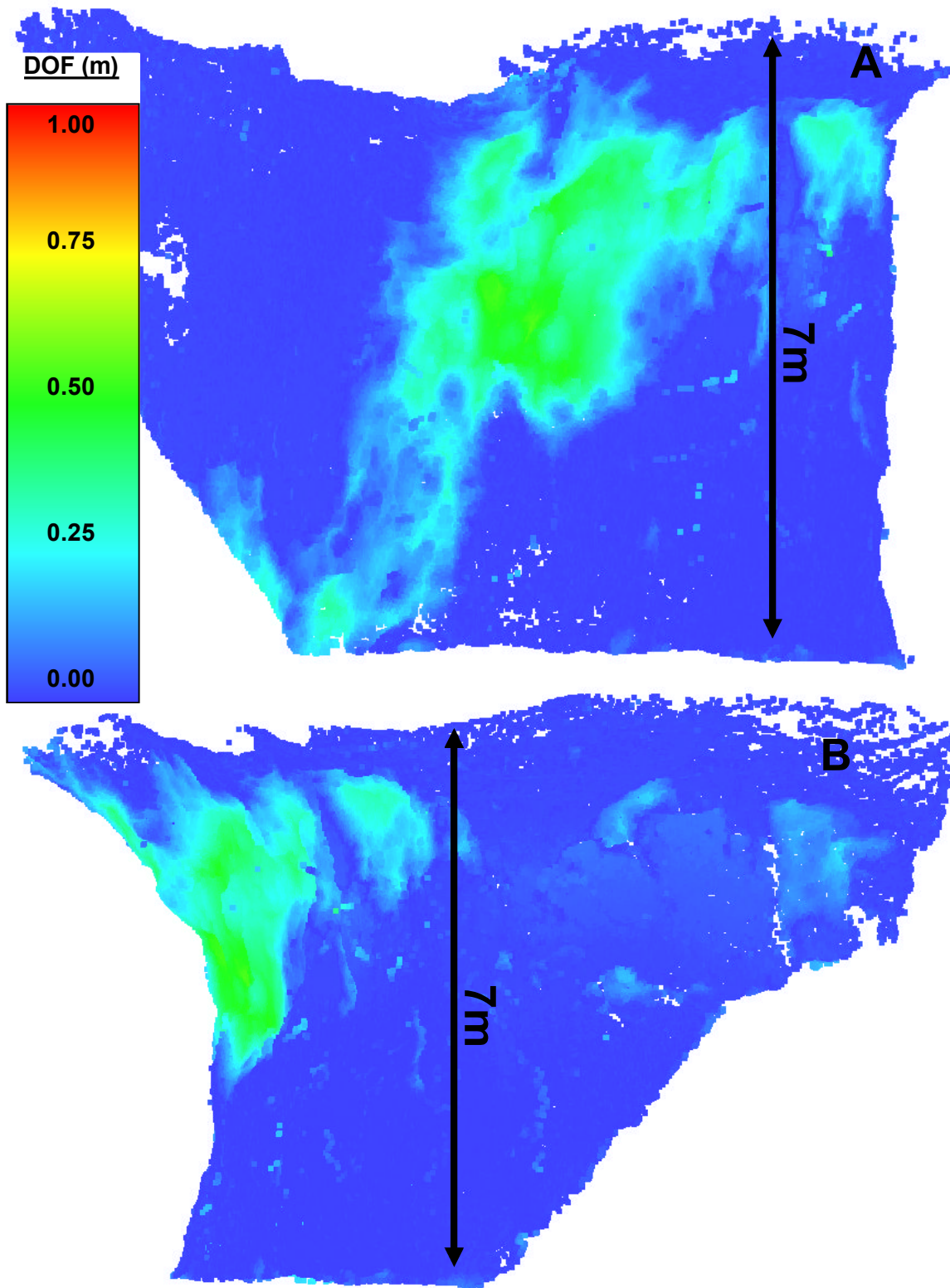


Figure D-56: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest (A) and Southwest (B)– Cumulative up to Epoch 113 – Adjusted Average Depth of Failure = 0.18 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

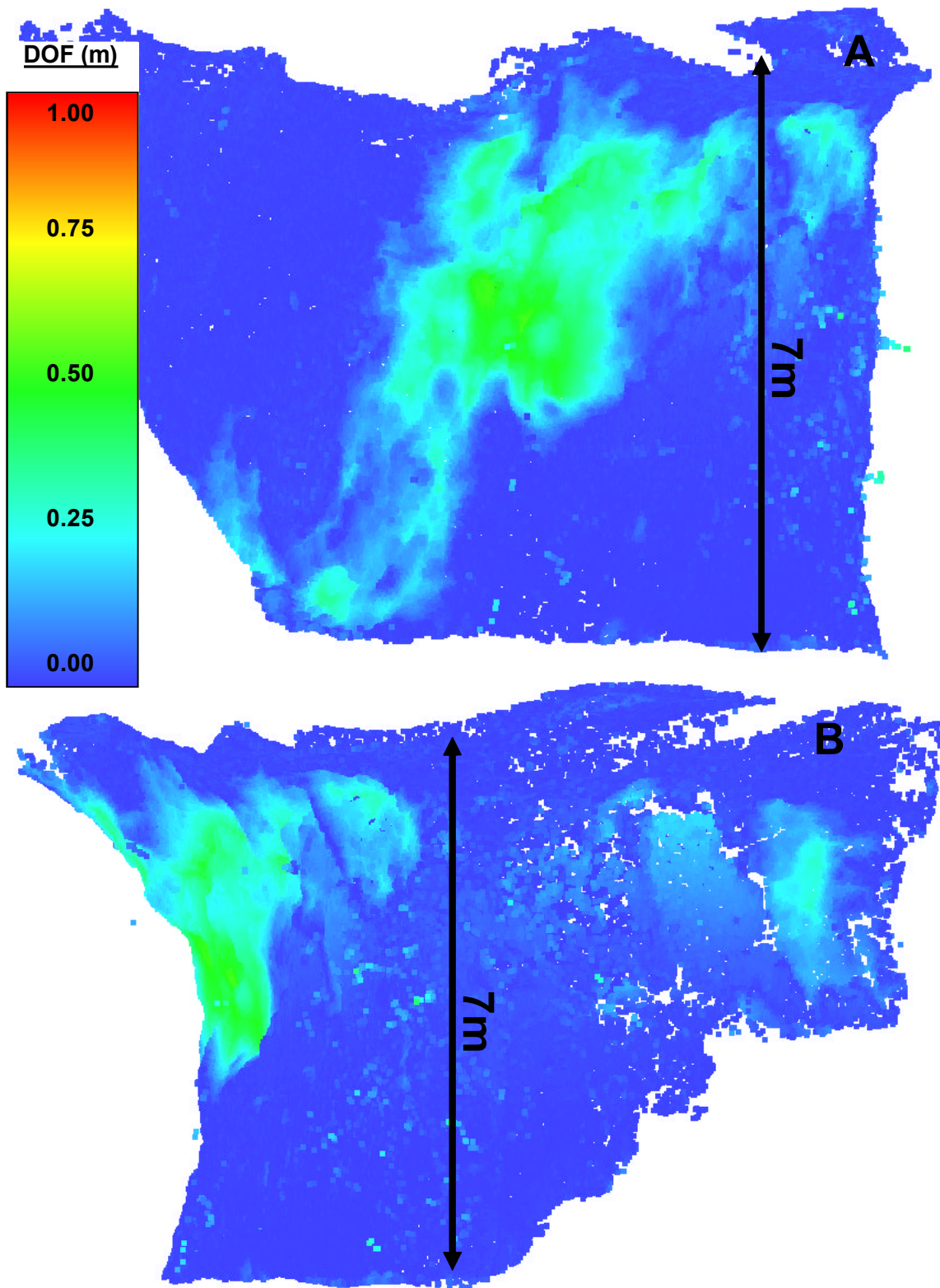


Figure D-57: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest (A) and Southwest (B) – Cumulative up to Epoch 140 – Adjusted Average Depth of Failure = 0.18 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

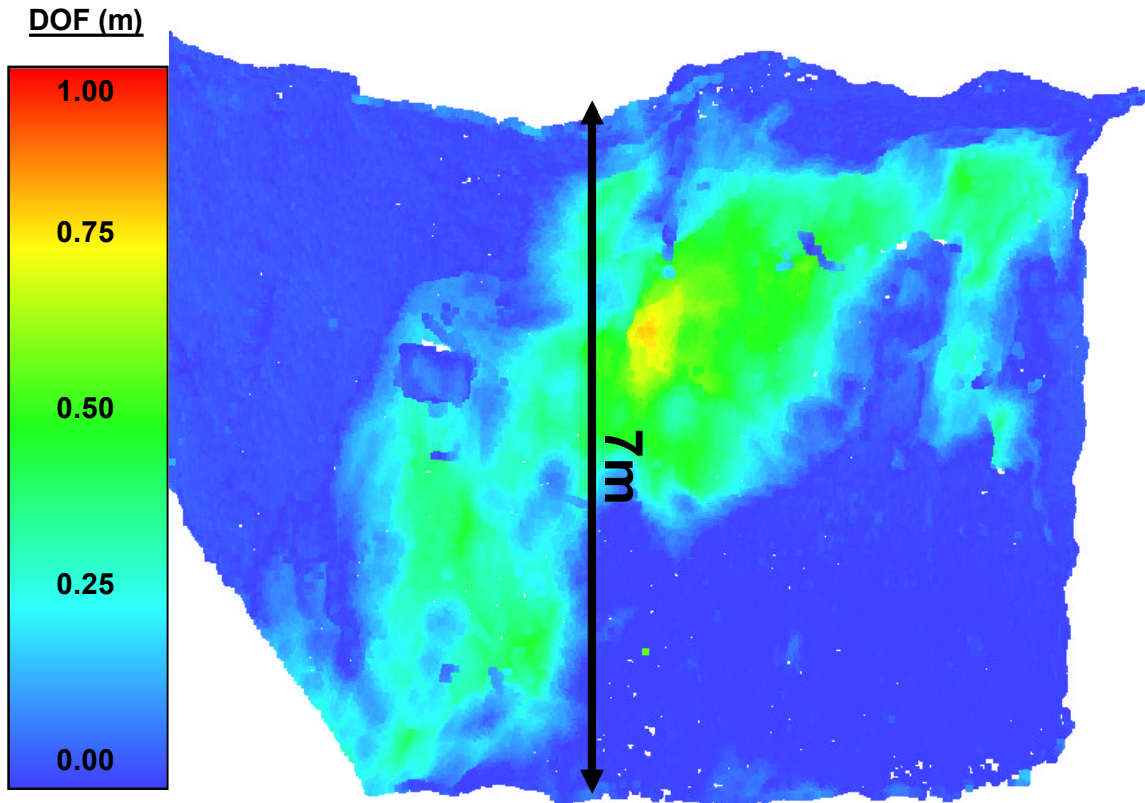


Figure D-58: Point Cloud of Pillar 18 with Depth of Failure Looking Northwest – Cumulative up to Epoch 168 – Adjusted Average Depth of Failure = 0.25 m. Failure Controlled by Sub-Vertical Joints. Horizontal Release is Often through Intact Fracture.

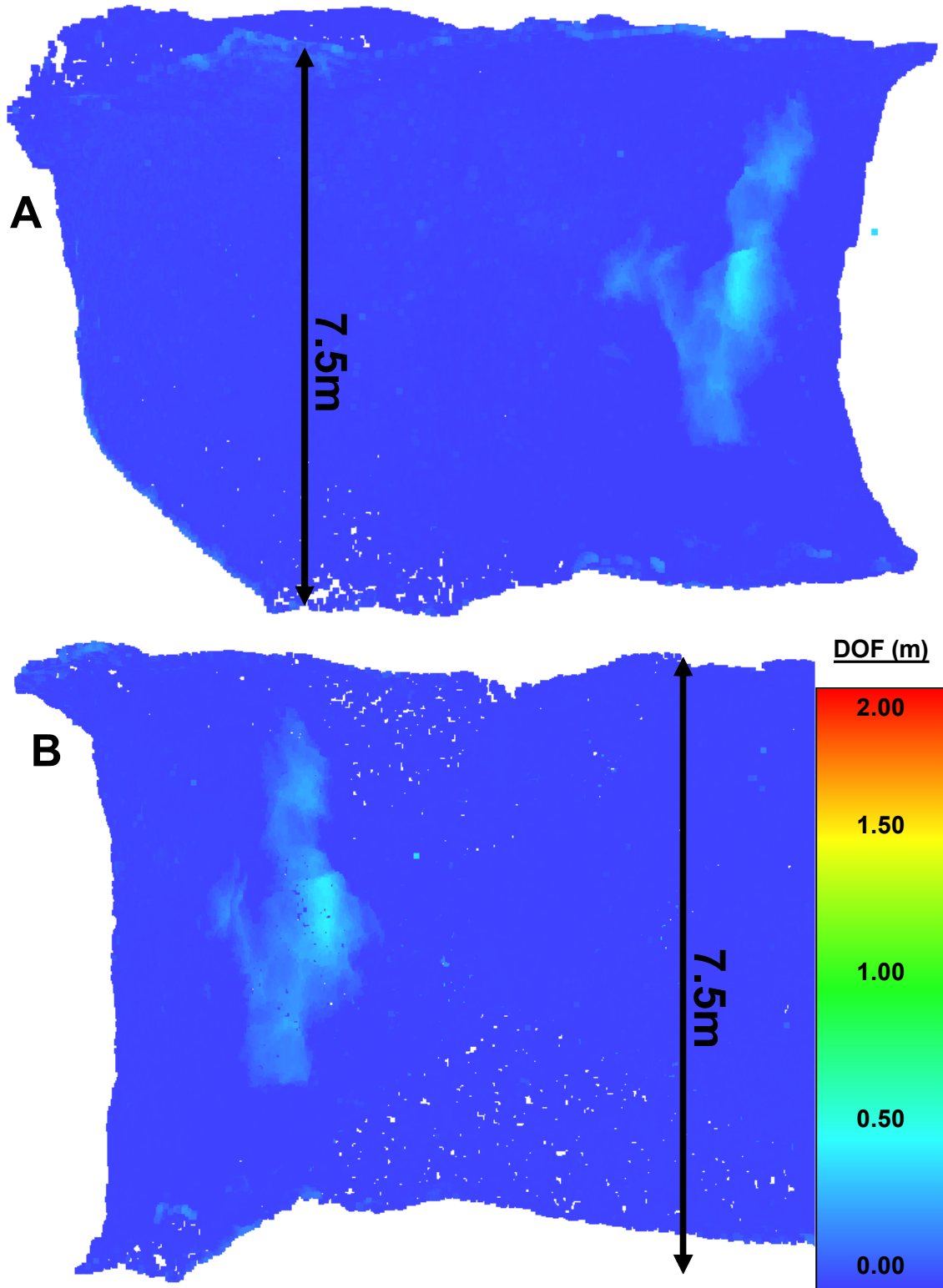


Figure D-59: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 49 – Adjusted Average Depth of Failure = 0.06 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

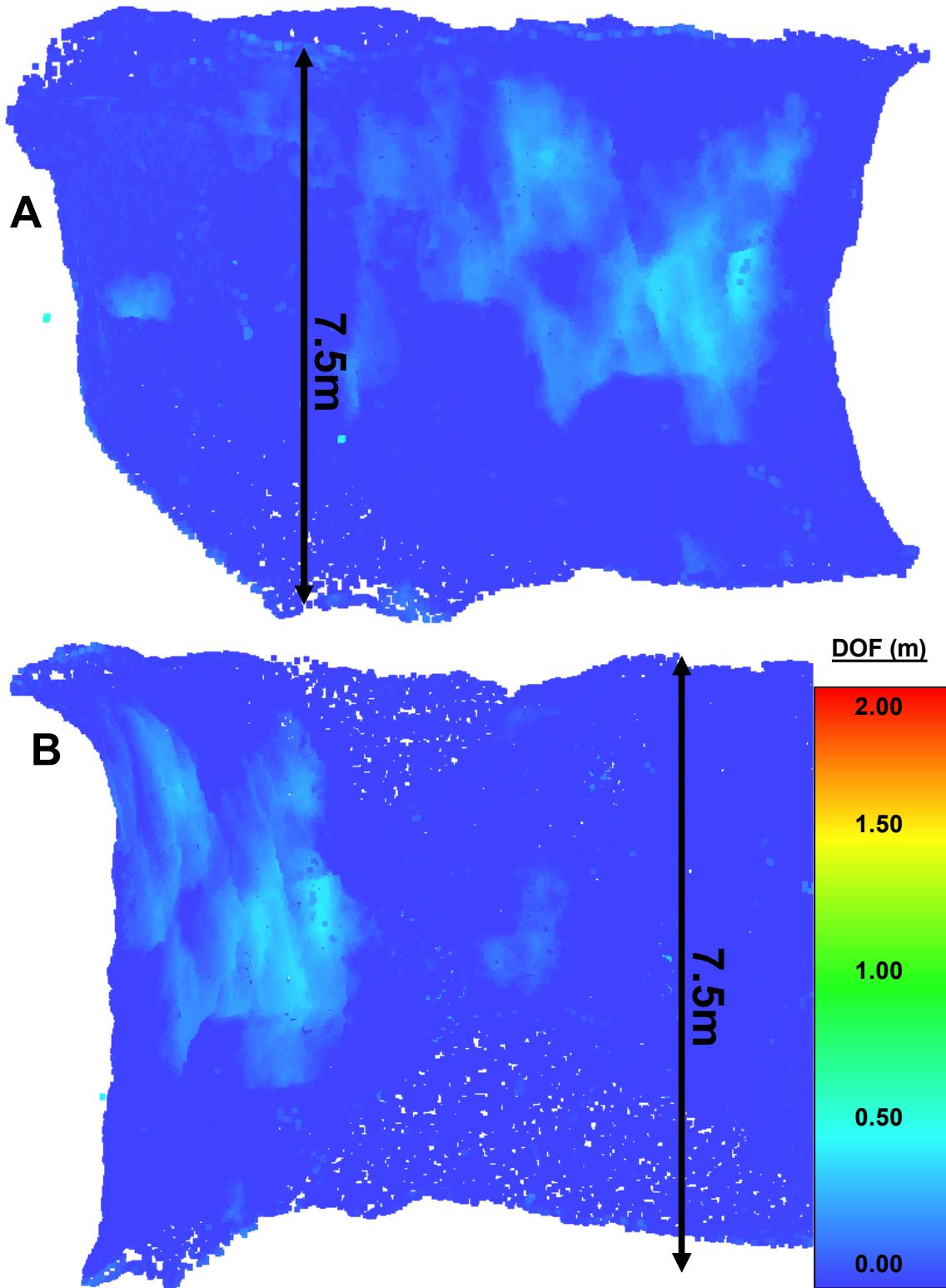


Figure D-60: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 58 – Adjusted Average Depth of Failure = 0.08 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

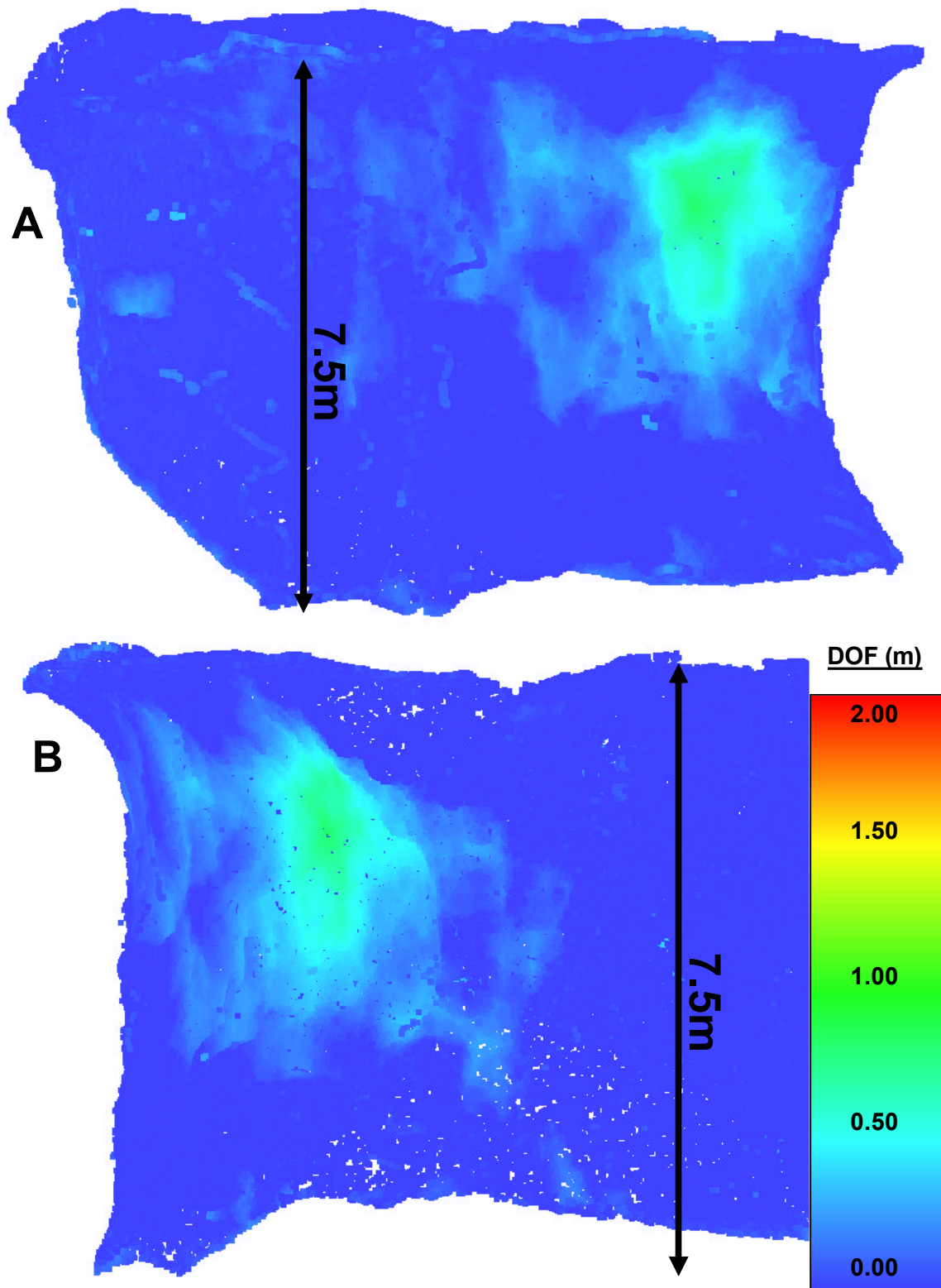


Figure D-61: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 84 – Adjusted Average Depth of Failure = 0.10 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

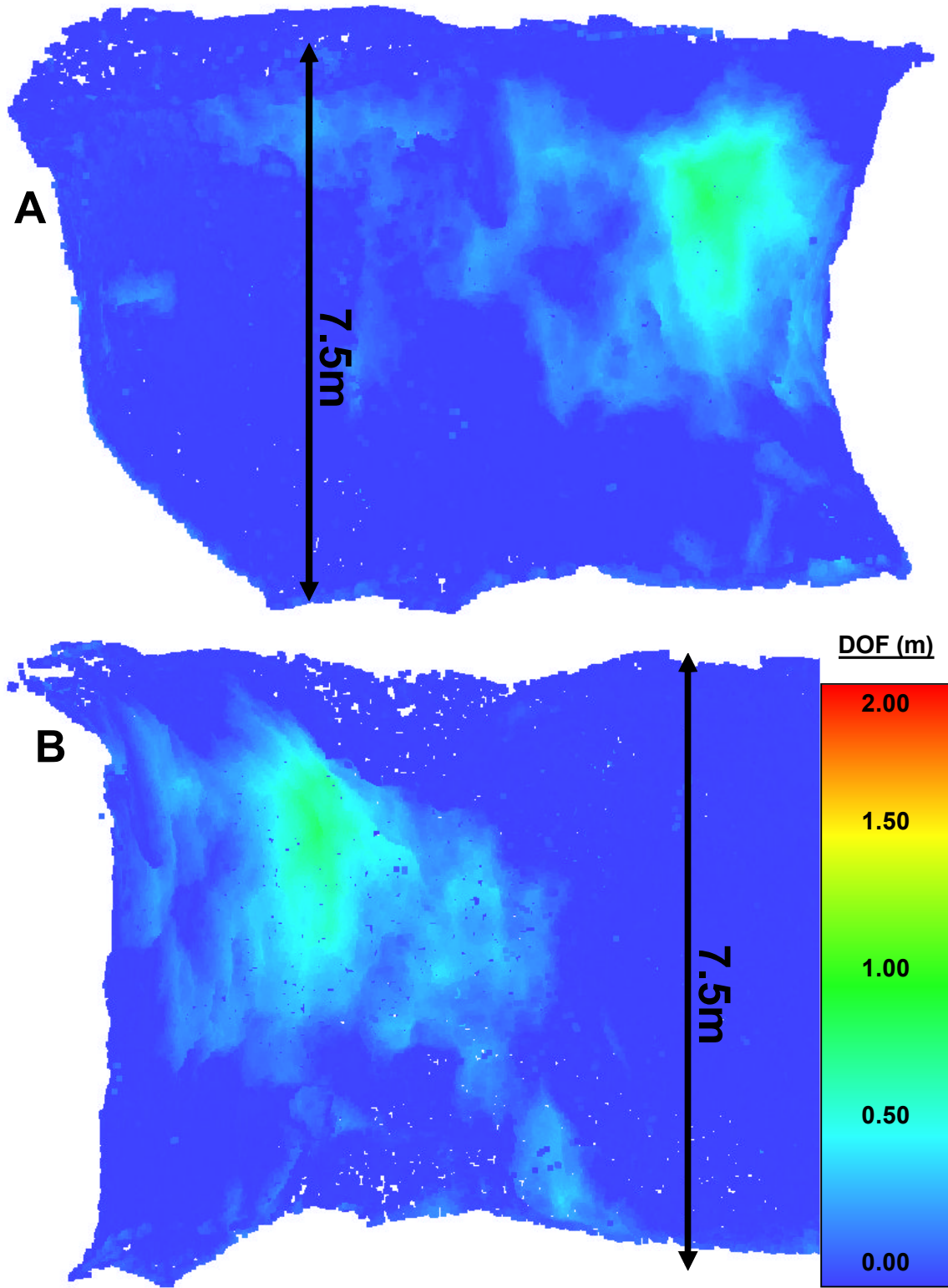


Figure D-62: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 113 – Adjusted Average Depth of Failure = 0.11 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

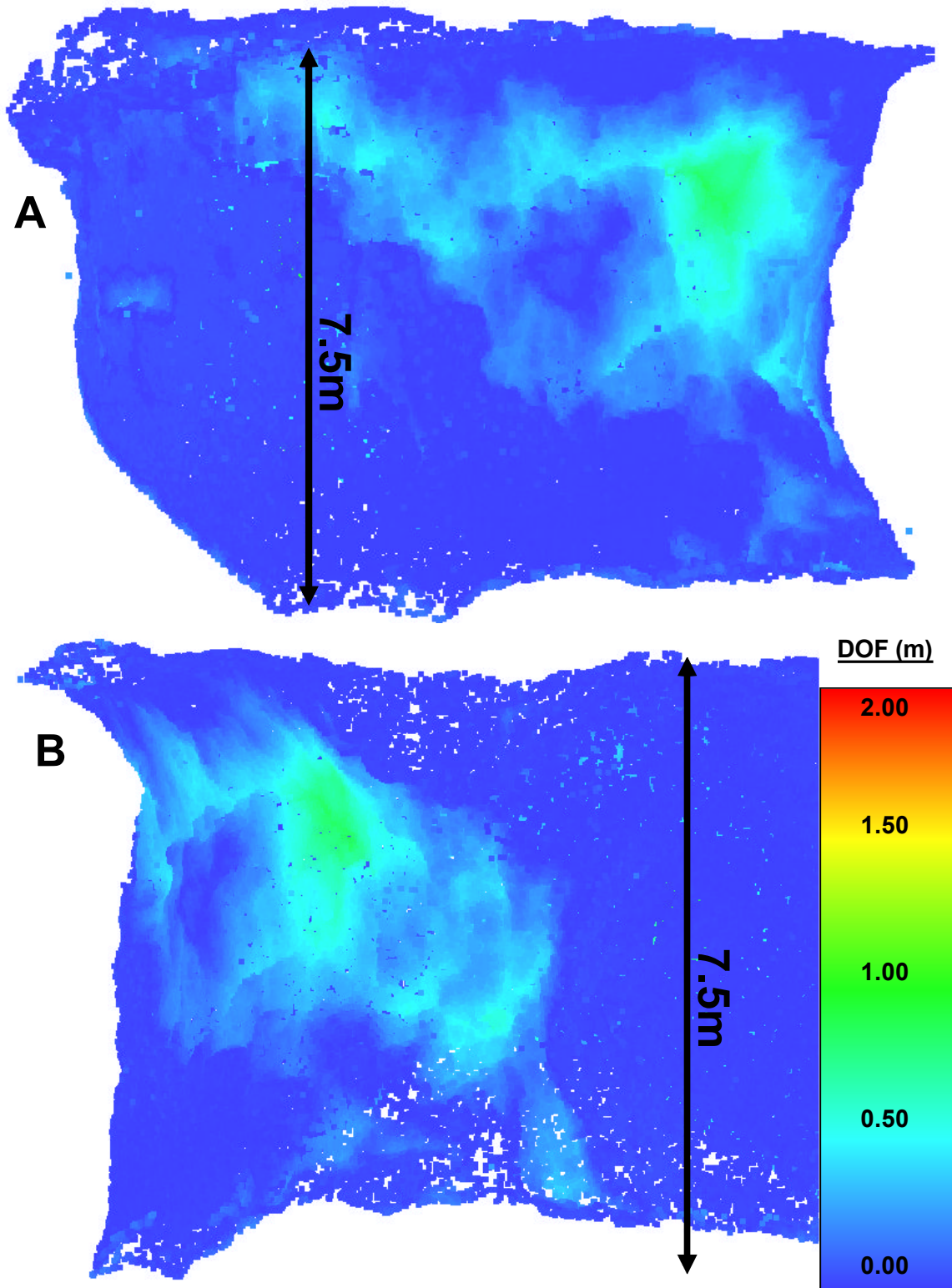


Figure D-63: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 140 – Adjusted Average Depth of Failure = 0.18 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

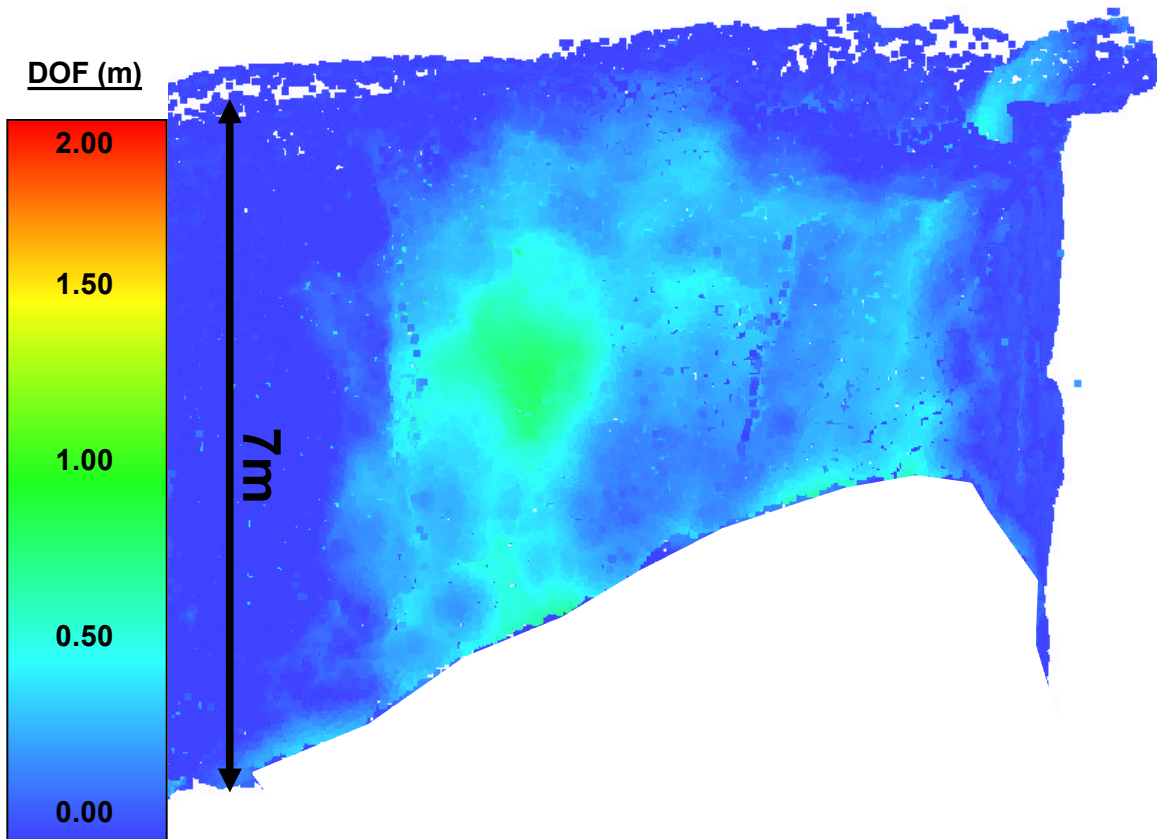


Figure D-64: Point Cloud of Pillar 19 with Depth of Failure Looking North – Cumulative up to Epoch 140 – Adjusted Average Depth of Failure = 0.18 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

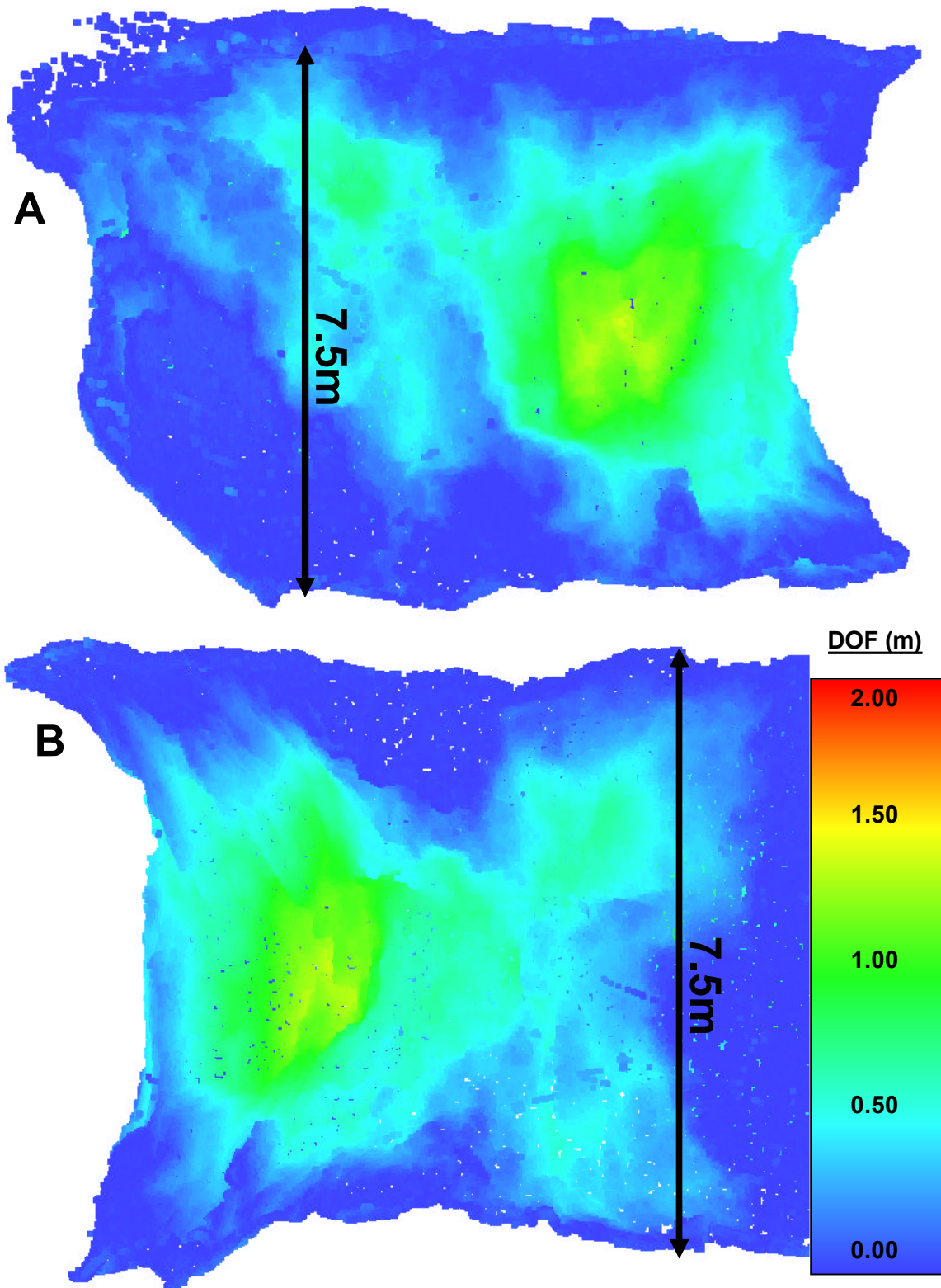


Figure D-65: Point Cloud of Pillar 19 with Depth of Failure Looking Southwest (A) and Southeast (B) – Cumulative up to Epoch 168 – Adjusted Average Depth of Failure = 0.35 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

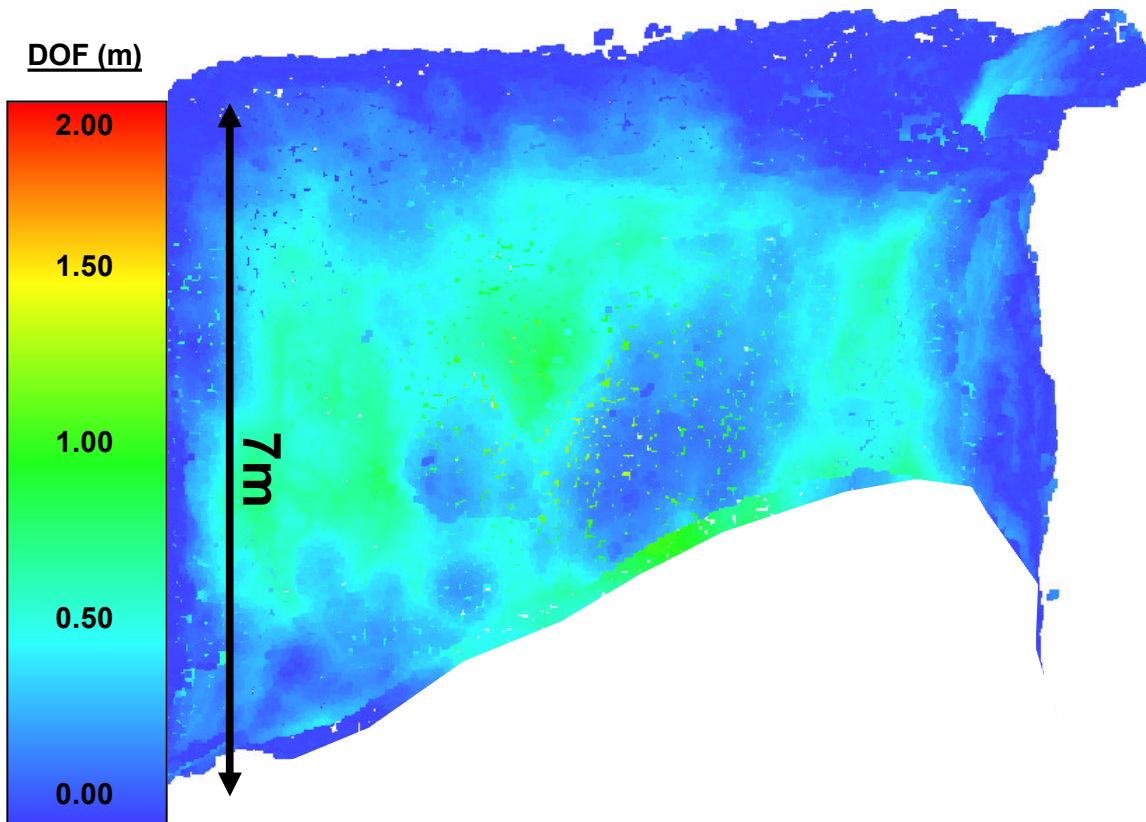


Figure D-66: Point Cloud of Pillar 19 with Depth of Failure Looking North – Cumulative up to Epoch 168 – Adjusted Average Depth of Failure = 0.35 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.

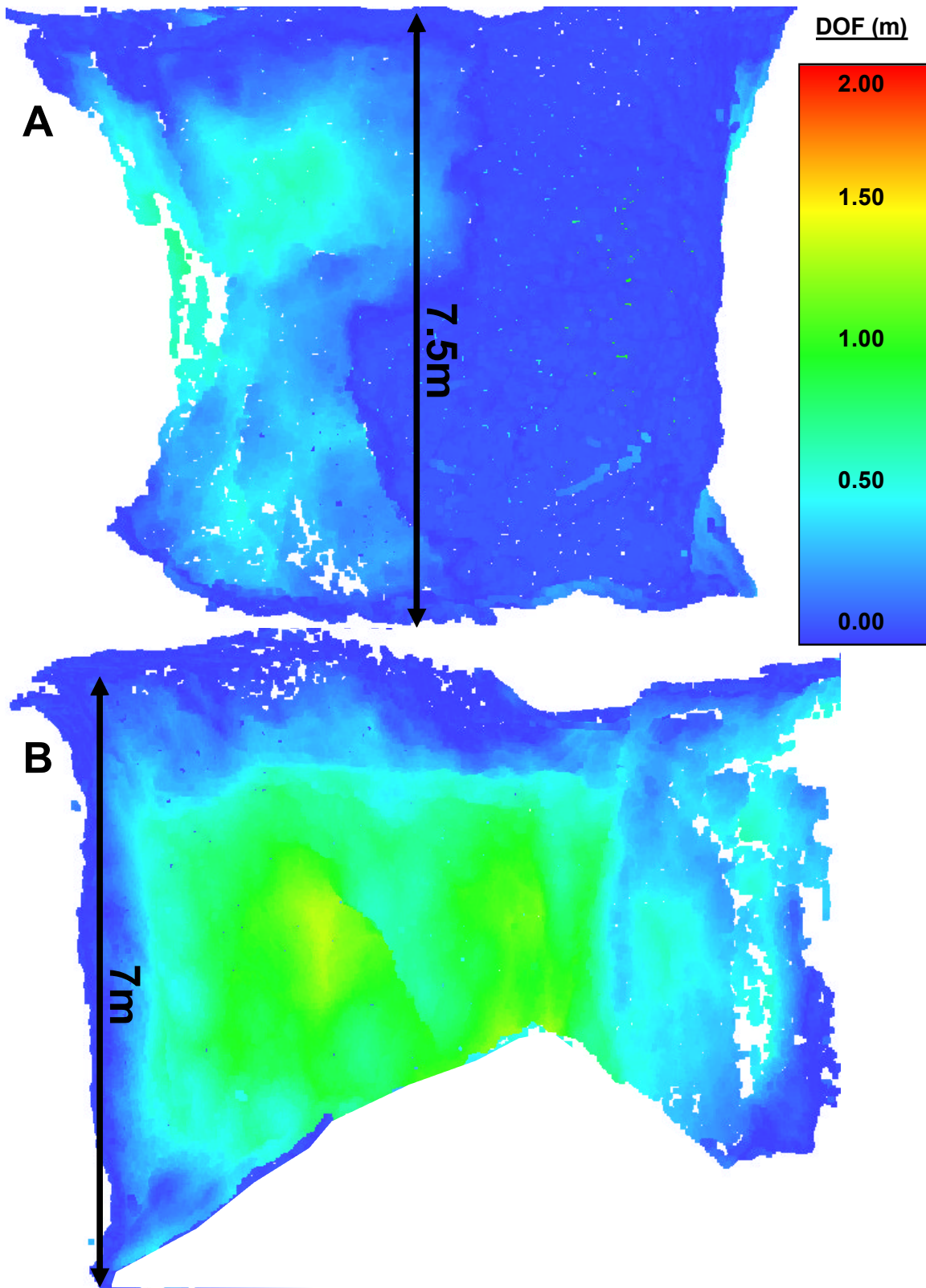


Figure D-67: Point Cloud of Pillar 19 with Depth of Failure Looking East (A) and Northwest (B) – Cumulative up to Epoch 196 – Adjusted Average Depth of Failure = 0.44 m. NOTE: Scale is from 0 to 2 m. Failure is Controlled by Sub-Vertical Joints with Significant Intact Rock Fracture. Horizontal Release is Often Through Intact Fracture.