Living the Deep-Sea Vent Lifestyle: Growth of a model extremophile, *Archaeoglobus fulgidus*, at elevated pressure

G.C. OLIVER[1*], A. CARIO[1], K. L. ROGERS[1,2]

[1]Department of Earth and Environmental Sciences, [2]New York Center for Astrobiology, (*correspondance: oliveg@rpi.edu), Rensselaer Polytechnic Institute, Troy, NY, USA.

Elevated pressures are an inherent environmental parameter in deep-sea hydrothermal vents where microbial metabolisms impact biogeochemical and energy cycles [1]. Here a model extremophile, *Archaeoglobus fulgidus*, is used to determine how high-pressure affects the growth and physiology of deep-sea and subsurface microorganisms. *A. fulgidus* cycles carbon and sulfur via heterotrophic and autotrophic sulfate reduction in various high temperature environments including shallow and deep-sea hydrothermal vents, and the deep marine subsurface [2]. In this study, *A. fulgidus* (type strain VC16) was grown heterotrophically from 0.1 - 80 MPa. *A. fulgidus* is piezotolerant up to 40 MPa with an optimum growth rate observed at 0.1 MPa. Exponential growth occurred up to 60 MPa, though growth yields were diminished at 50 MPa and 60 MPa compared to ambient pressure controls. Subsampling decompression had little to no apparent affect on *A. fulgidus* growth up to 40 MPa. Biofilm production, a common stress response in this strain [3], was observed in our primary lactate/sulfate rich medium during high-pressure growth but was not observed with lower concentrations of lactate and sulfate. Associated with increasing aqueous sulfide concentrations, the formation of biofilm by this strain may not be a direct result of elevated pressure, but rather a response to falling energy yields and elevated toxins. Thus, *A. fulgidus* biofilm formation might lend insight to deep-sea microbial adaptive strategies towards environmental fluctuations. Here, *A. fulgidus* continues carbon, sulfur, and energy cycling nearly unaffected by elevated pressures up to 40 MPa, consistent with deep-sea hydrothermal ecosystems and the subsurface environments in which this species has been observed. Furthermore, these results exemplify the importance of laboratory growth conditions better reflecting *in situ* environmental parameters.

[1] Picard & Daniel (2013) *Biophys. Chem.* **183,** 30-41. [2] Hartzell & Reed (2006) *Prokaryotes* **3**, 82-100. [3] LaPaglia & Hartzell (1997) *Appl. Environ. Microbiol.* **63**, 3158-3163.