Atacama Desert as a Model for Hyper-arid Exoplanets

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Introduction - Goals

**Question:** What might life be like on hyper-arid exoplanets and how might we find it?

1.) Predict traits of extraterrestrial life
2.) Determine how life survives
3.) Develop working biosignatures
The Atacama is similar to the environments we are interested in:

- High UV Flux
- Minimal rainfall
- Cool temperatures
- Near absence of life
- Hostile soil conditions
- Oldest and driest desert on Earth
Methods – Soil Collection & Analysis

Location of soil sites; color matches name in table to the right
Methods – Isolates

Phase 1
- Soil Collection
- ISP-4 Agar Plates
- Bacterial Isolates
- Isolate Growth

Phase 2
- Liquid Media Growth
- DNA Extraction
- Nanodrop Test
- DNA Extraction

Phase 3
- PCR Process
- Gel Electrophoresis
- DNA Sequencing
- Replication & Analysis
Higher annual precipitation results in more life.

- More Chemoautotrophs than Heterotrophs
- Most isolates grew from surface soil
• Similar to life found in other hyper-arid areas
• Part of Actinobacteria phyla
• Actinobacteria survive via atmospheric $H_2$
• Potential C sources:
  - Carbon Dioxide
  - Carbon Monoxide

Phylogenetic tree of a single isolate compared to phyla with similar evolutionary relationships
Data shows us what life might look like

Need more of the DNA sequenced

How do these life forms survive?

Analyze metabolic pathways

How can we find these life forms?

Biosignatures produce false positives
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THANK YOU