Briefing Topic:

Colton Crater, Arizona: A Lunar Analogue Training Site

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Contents:

- Regional geologic context
- Views of Colton Crater
- Geology of Colton Crater
Regional Geologic Context

Outline of volcanic field that is visible in remote sensing images

San Francisco Volcanic Field
Flagstaff, Arizona

6 - 2.5 million years (approximate)
2.5 - 0.7 million years (approximate)
less than 0.7 million years
Regional Geologic Context

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Proposed Flagstaff-area Test Sites (1969)

- SP Crater & Lava Flow (including Colton Crater, then known as Crater 160)
- Cinder Lakes (& Crater Field)
- Black Point Lava Flow
- Merriam Crater

This is the map in the original 1969 test site proposal.
Proposed Flagstaff-area Test Sites (1969)

Colton Crater

Modern DEM of the northeastern portion of The San Francisco Volcanic Field.
Proposed Flagstaff-area Test Sites (1969)

Colton Crater

Modern DEM of the northeastern portion of The San Francisco Volcanic Field.

Black Point Lava Flow area used to test four lunar surface mission scenarios, October 2008.
Crater 160 (now Colton Crater)

Colton Crater

- A tuff ring or cone, related to explosive maar craters
- Rim diameter is 1.2 km
- The highest portion of the crater rim is ~450 m above surrounding landscape
- The crater floor is 80 m below the surrounding landscape
- The crater walls contain mantle and crustal xenoliths

View from the northwest to southeast. Mid-October.

0.2 to 0.8 Ma
Colton Crater

Satellite view
Colton Crater

Aerial, south-facing view w/ winter snow

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Colton Crater

Precipitation can cause grasses to grow and bushes to leaf out.
Yet, the vegetation does not cover rock exposures on the upper crater wall in northeast and south; nor does it cover a basalt dike In the north crater wall.

And elsewhere on the crater interior, the vegetation is very thin, so the geology is still easily seen.
Thus, vegetation will not affect crew training activities
Colton Crater

But could potentially affect wide-field spectrometry
Colton Crater

Layered volcanic deposits
Colton Crater

<table>
<thead>
<tr>
<th>Layer</th>
<th>Thickness</th>
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<tbody>
<tr>
<td>15 m tuff</td>
<td></td>
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<tr>
<td>25 m cinders</td>
<td></td>
</tr>
<tr>
<td>7.5 m basalt flow</td>
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<tr>
<td>27.5 m cinders</td>
<td></td>
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<tr>
<td>75 m of total section</td>
<td>measured by Cummings (1972)</td>
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Kring/Space Sciences
Lunar Exploration Initiative

2008
Colton Crater

Late stage cinder cone (6 m high)
Xenoliths within Colton Crater
Xenoliths within Colton Crater

Xenoliths

Most abundant varieties
- Clinopyroxenite
- Wehrlite

Also present
- Dunite
- Lherzolite
- Websterite
- Gabbro
- Norite
- Anorthosite
- Granite
- Granulite
- Paleozoic sedimentary rocks
Ultramafic (Mantle) Lithologies
Ultramafic (Mantle) Lithologies
Basaltic Pyroclastic Bombs
Basaltic Pyroclastic Bombs
Basaltic Pyroclastic Bombs

- Meter-size bomb
- Scoria litters the surface
- Agglutinated spatter
References


Colton Crater

Additional Images
Xenoliths within Colton Crater
Regional Geologic Context

Final eruptive phase

A 6 m high cinder cone grew on the crater floor.
Regional Geologic Context
Regional Geologic Context

Xenoliths in lava flows
Evidence of depth and source of magma
Regional Geologic Context

Aerodynamic “bombs”
Particularly near vents
Regional Geologic Context

Flow features
Like flow banding or schlieren

SP Crater
Regional Geologic Context

Variable oxidation particularly in deposits near vents

SP Crater