

# Glenn Extreme Environments Rig (GEER)

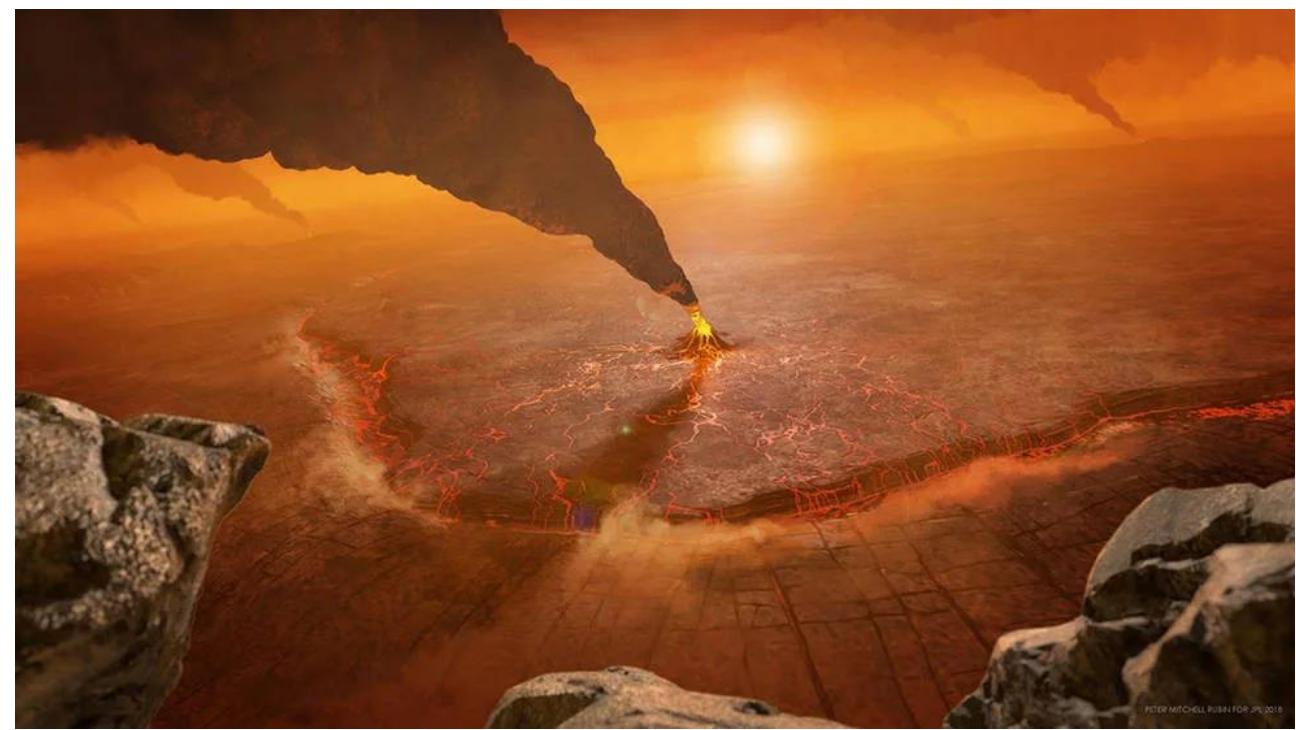
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## GEER 101:



- NASA center of excellence for Venus science R&A, technology development and potential mission V&V campaigns
- World class facility and a Planetary Science Community's asset
  - GEER is capable of simulating other extreme environments in the Solar System (e.g., temperature, pressure and atmospheric gas mixes)

### Dimensions:

- 3' ID x 4' L (internal) – 811 L volume
- End Cap: large flange that can be removed to access the full interior of vessel
- 4" & 3" flanges for feedthrough (power & instruments) access

### Pressure: 1 to 1500 psia (0.07 - 103 bar)

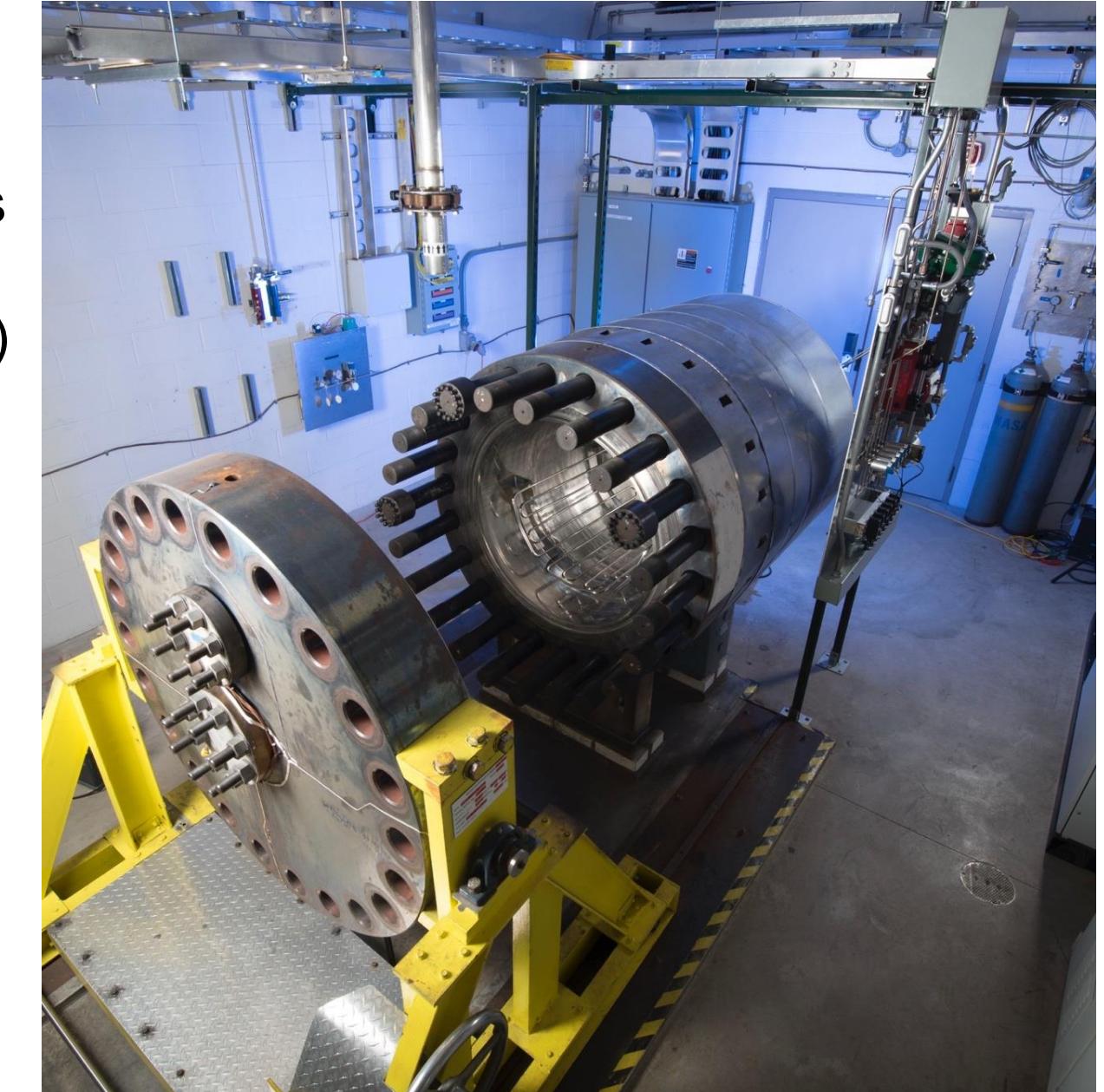
### Temperature: 70 to 1000° F (20 to 538° C)

### Gas Distribution:

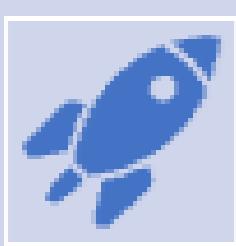
- 8 specialty gas cabinets + 1 liquid injection system
- Gas booster pump for real time constituent boosting

### Analytics:

- 4-column gas chromatograph (GC) – reading accuracy to PPM
- Mass spectrometry



## Passive & Active Test Capabilities:



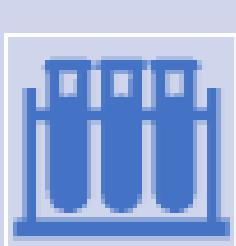
### Juno Mission Support

To enable science driven exploration of water vapor impacts at various Jupiter related conditions on microwave sensing



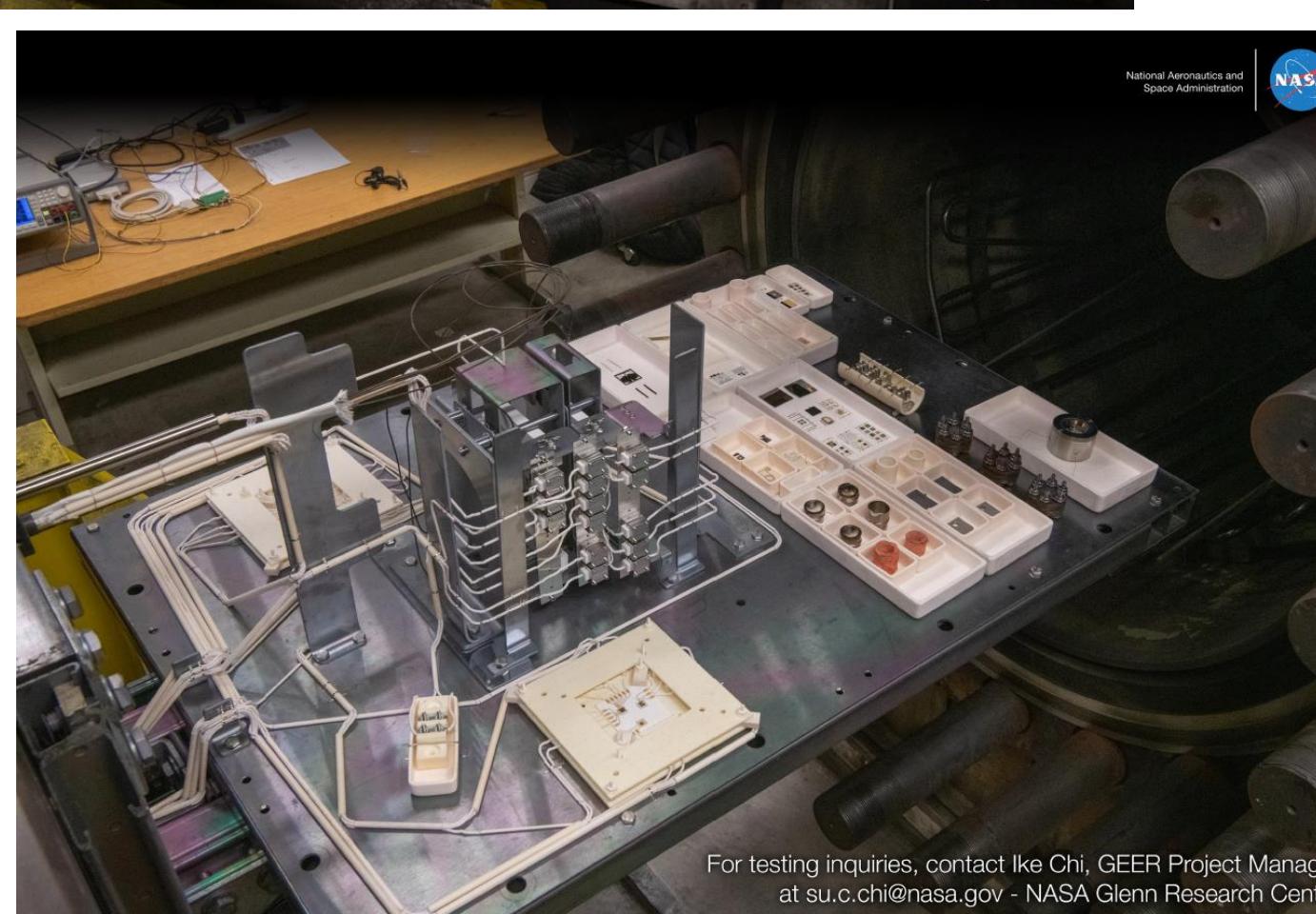
### Weathering test of Rocks and Minerals<sup>2</sup> (Marty's Mineral Test)

GEER demonstrated a newly added capability of being able to support over 200+ passive samples in one test run



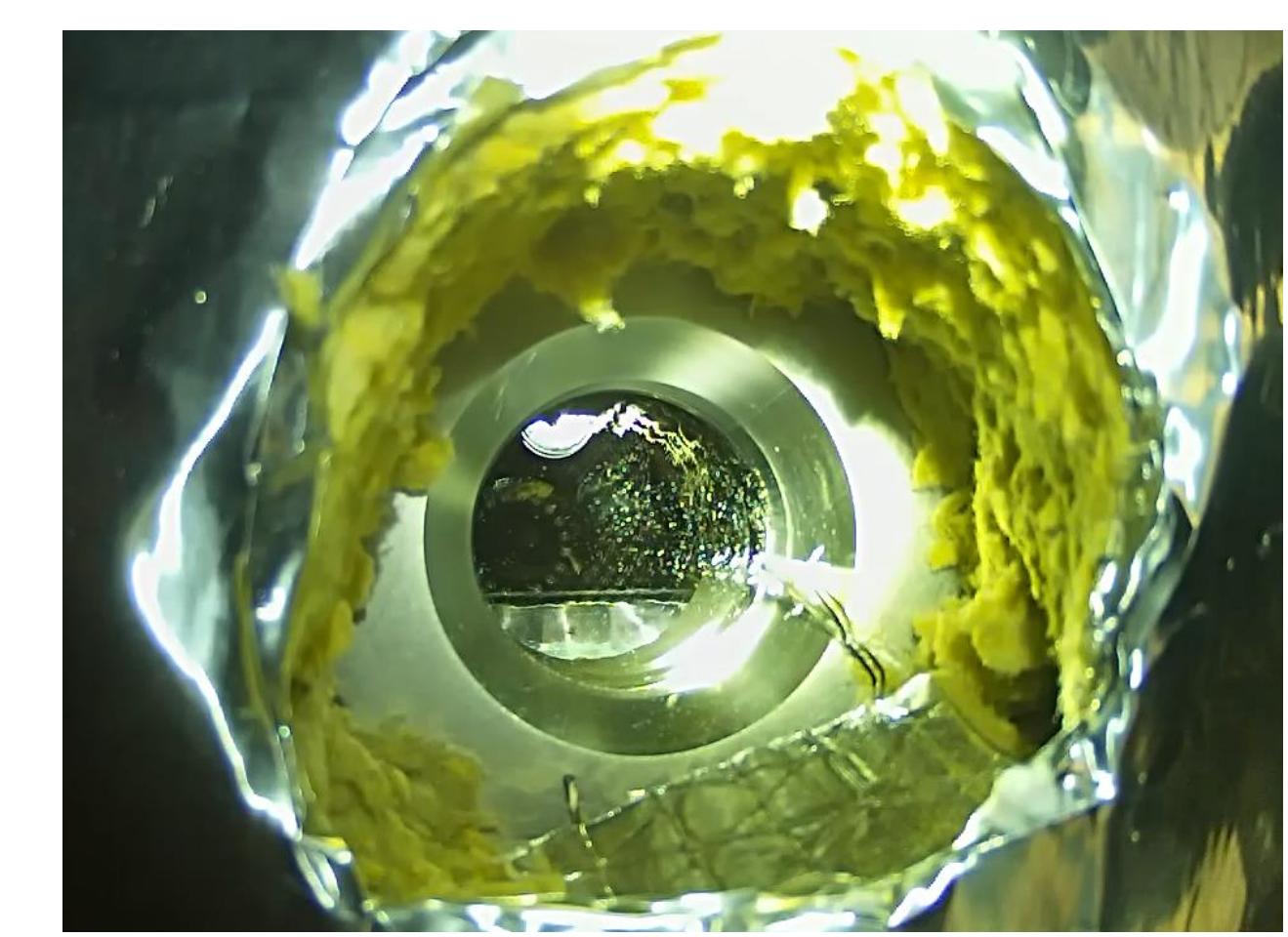
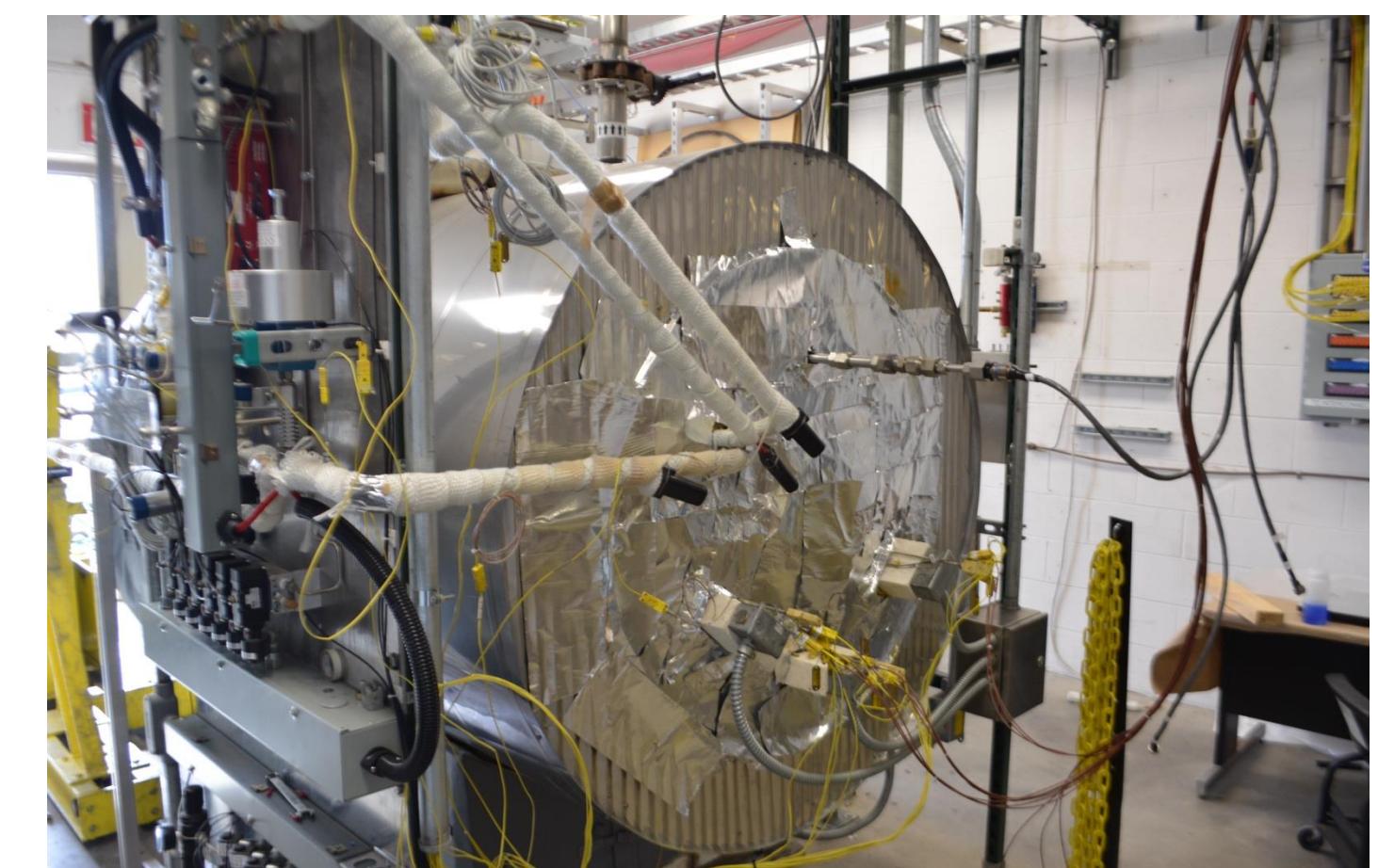
### HOTTech Tests

High temperature technologies from a variety of research groups (i.e., government, university & private industry)



### Baseline Test

To determine GEER's baseline SO<sub>2</sub> consumption during testing



GEER window during check out test  
Viewing area: 2.5 inches in diameter

## GEER Operational Processes:

### Test Planning (4 to 8 weeks)

Submit Inquiry through the GEER website:  
<https://www1.grc.nasa.gov/space/geer/contact-us/>

Customers fill out the Test Requirements Document (TRD)\*

GEER Team Performs Customer Test Requirements Document (TRD)\* Review

Material Review Board (MRB)

Iterative Technical Discussions Between GEER Team and Potential Customers

\*TRD should include customer's test objectives, test plans & approaches and sample descriptions

For testing inquiries, contact Ike Chi, GEER Project Manager at [ike.chi@nasa.gov](mailto:ike.chi@nasa.gov) or on our website: <https://www1.grc.nasa.gov/space/geer/contact-us/>

**Highly knowledgeable staff available for test techniques and planning support for differing planetary challenges**



## References & Acknowledgements

[1] Paul G. Steffes et. al., Laboratory measurements of the 15-46 cm wavelength opacity of water vapor under temperature conditions characteristic of the deep atmosphere of Jupiter. *Icarus* 404 (2023) 115679.

[2] Alison R. Santos et. al., Experimental Weathering of Rocks and Minerals at Venus Conditions in the Glenn Extreme Environments Rig (GEER). *J. of Geophysical Research: Planets* 128 (2023) pp.1-39

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