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Germanium from Martian Volcanoes

The Office of Postdoctoral Affairs

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Degassing of Germanium from Martian Volcanoes

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NATIONAL HIGH
MMAGNETIC
FIELD LABORATORY

Image credit: The Cosmos News

**Water outgassed from volcanoes
was lost by photolysis and
gravitational escape of hydrogen.**

**Water formed geological
features on Mars, e.g. dry
valleys.**

Now vs. 4×10^9 years ago

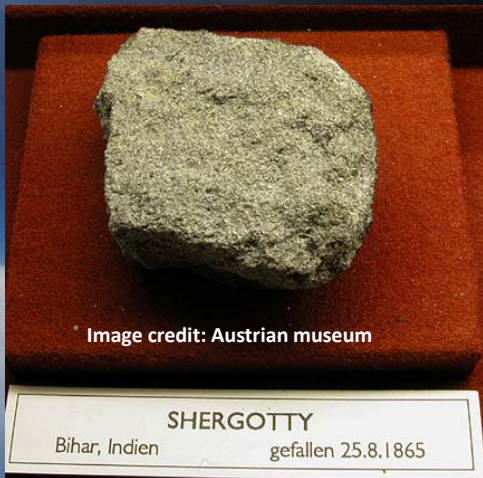
How to estimate the original outgassed water budget?

Volatiles Degassed from Martian Volcanic Eruption

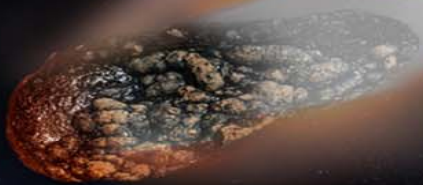
Olympus Mons: the largest volcano in the solar system

- ~80%: water vapor (H_2O).
- ~10%: carbon dioxide (CO_2).
- ~8%: sulfur dioxide (SO_2).
- **Trace: volatile metals such as germanium (Ge), arsenic (As), zinc (Zn), mercury (Hg).**

Looking for the Evidence of Volatile Metal Degassing in Martian Volcanic Rocks- (SNC) Meteorites



Shergottites (S)



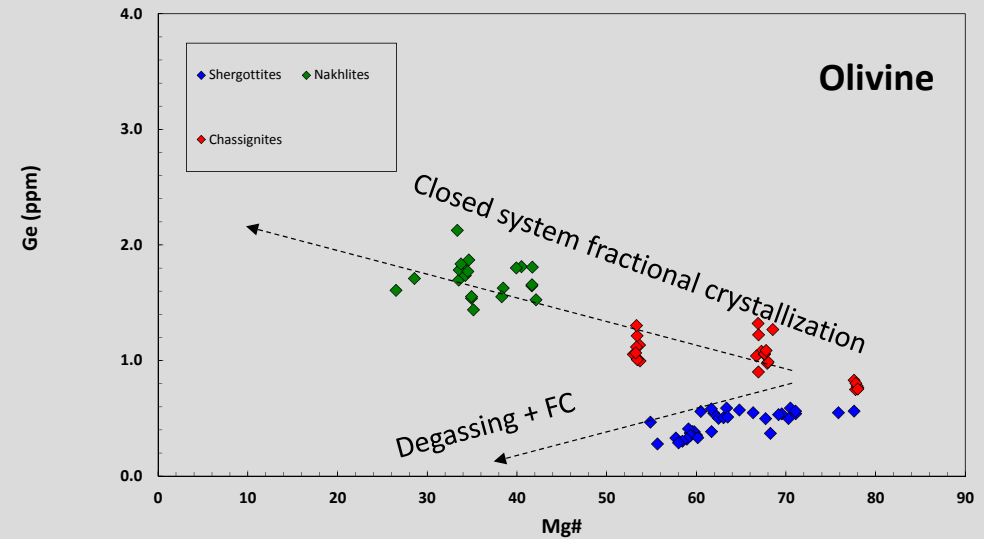
Nakhlites (N)



Chassignites (C)

Martian Meteorites Analyzed by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS)

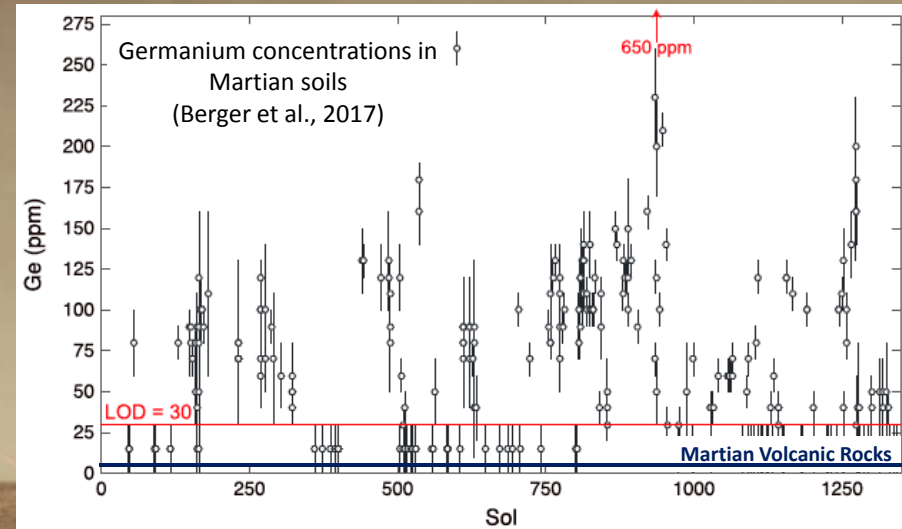
LA-ICP-MS at geochemistry facility in
national high magnetic field laboratory
(Mag-Lab)



**Germanium degassed from
Shergottite magmas.**

Germanium Enrichment in Martian Soils

Alpha-particle X-ray spectrometer (APXS) on
the Mars Science Lab (MSL) rover, Curiosity



Outgassed Ge from Martian volcanoes precipitates into soils.

Implications for the Martian water budget: if the abundance of water could be coupled to that of Ge, the original outgassed water budget could be estimated.

This would provide an estimate of the volume of water available to form the dry valleys on Mars.