

Isotope measurements of volatiles from the polar region of Moon.

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- How much of volatiles we **expect** on Moon?

Needs of information regarding “**Climatology on Moon**”:

Sources

Volatile sources, fluxes, and their change over time.

Behavior

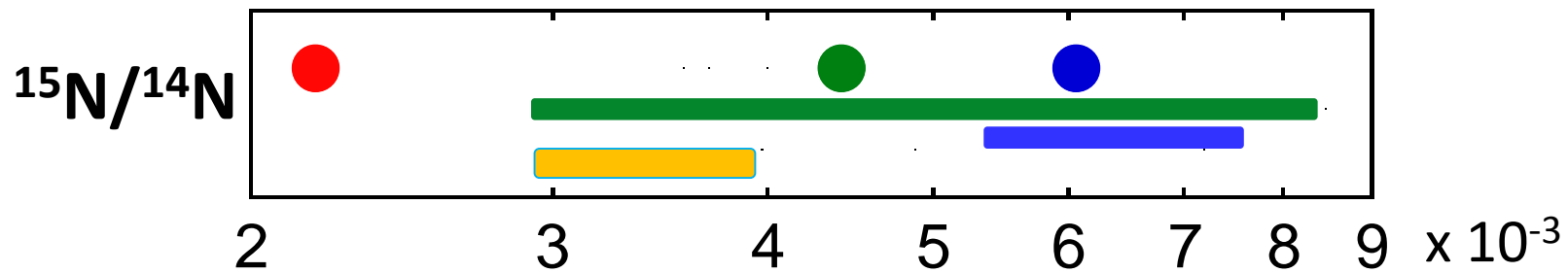
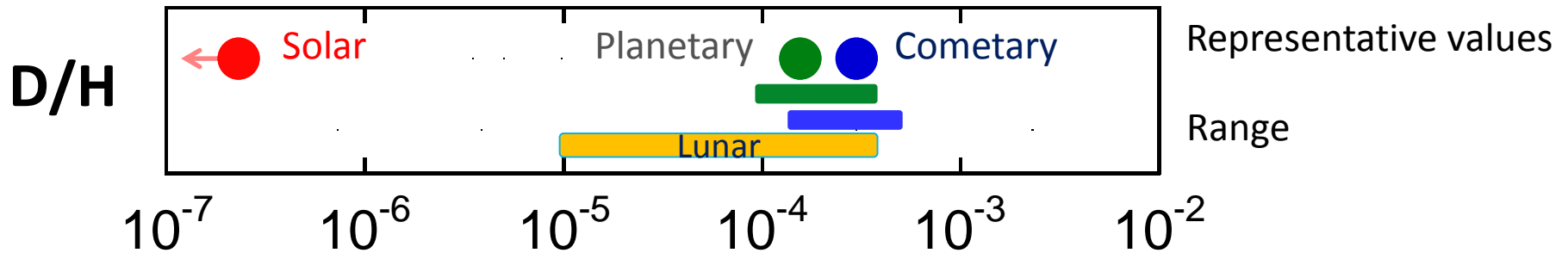
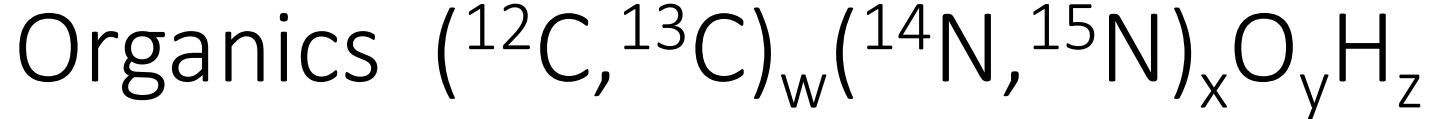
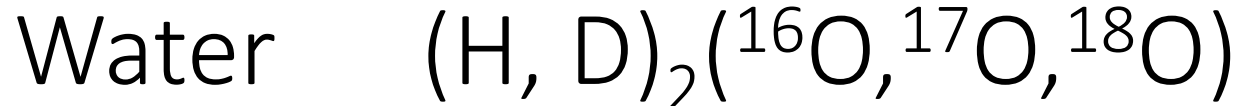
Chemical reactions (Volatile Elements → Volatile Compounds)

Migration (Entire surface of Moon → Polar region)

Trapping (Permanent shadow? In the regolith?)

Dissipation (Process, and timescale)

Isotopes



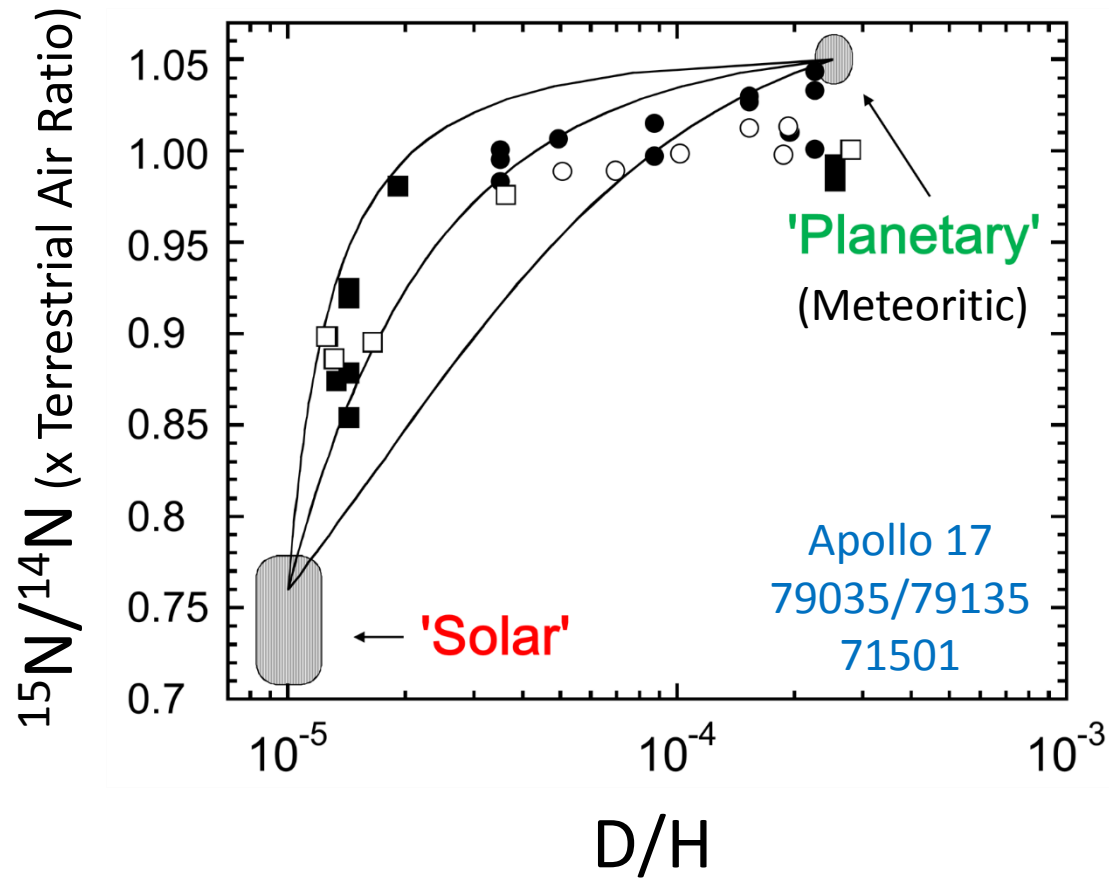
Volatiles on Moon – Past Studies

Water & Organics (compounds): Not observable in Apollo samples

Solar Wind: The only volatile source available on Moon? **No!**

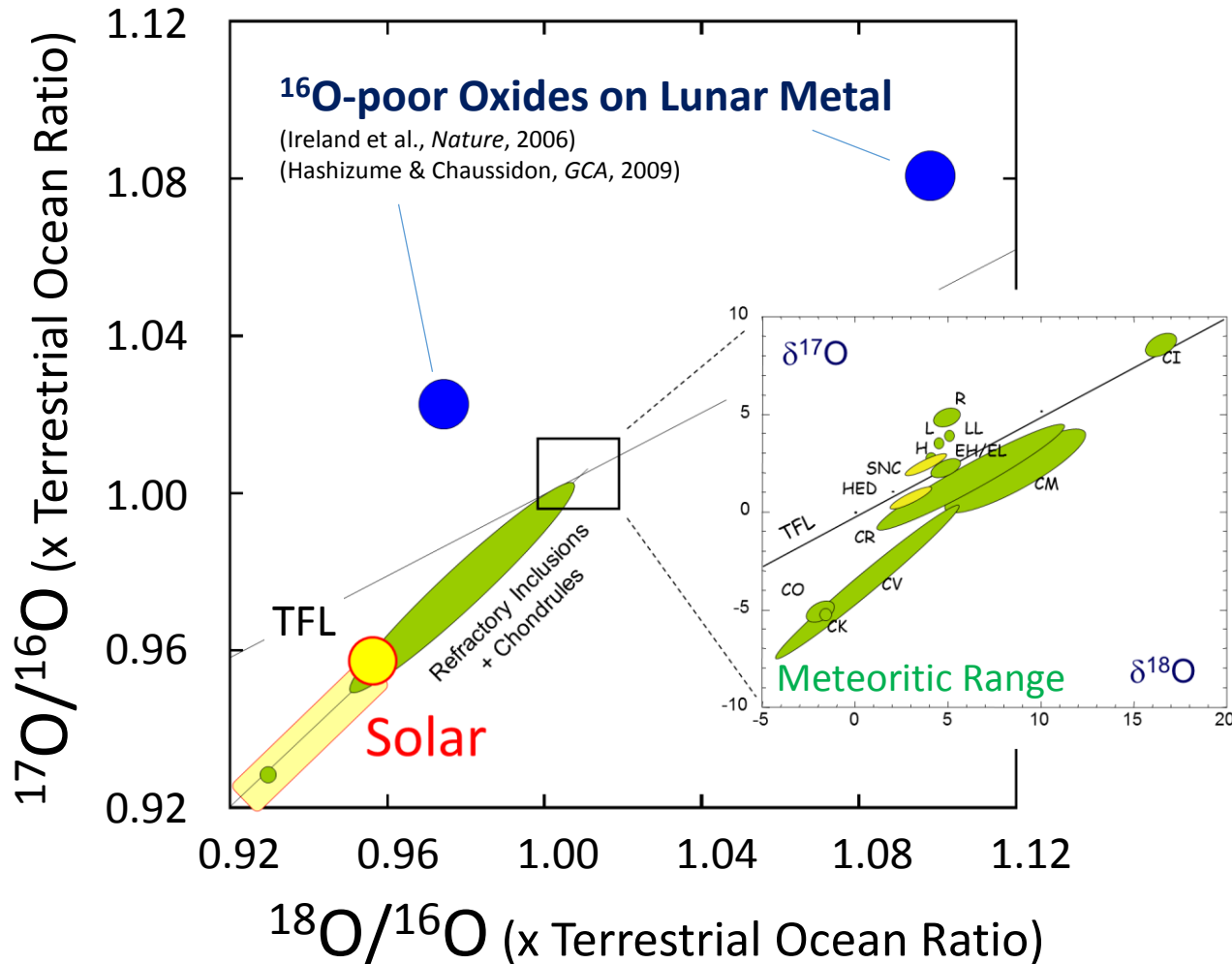
Search of non-solar volatile sources on Moon
as by-products in solar wind research

Lunar N = Solar + Micrometeorites

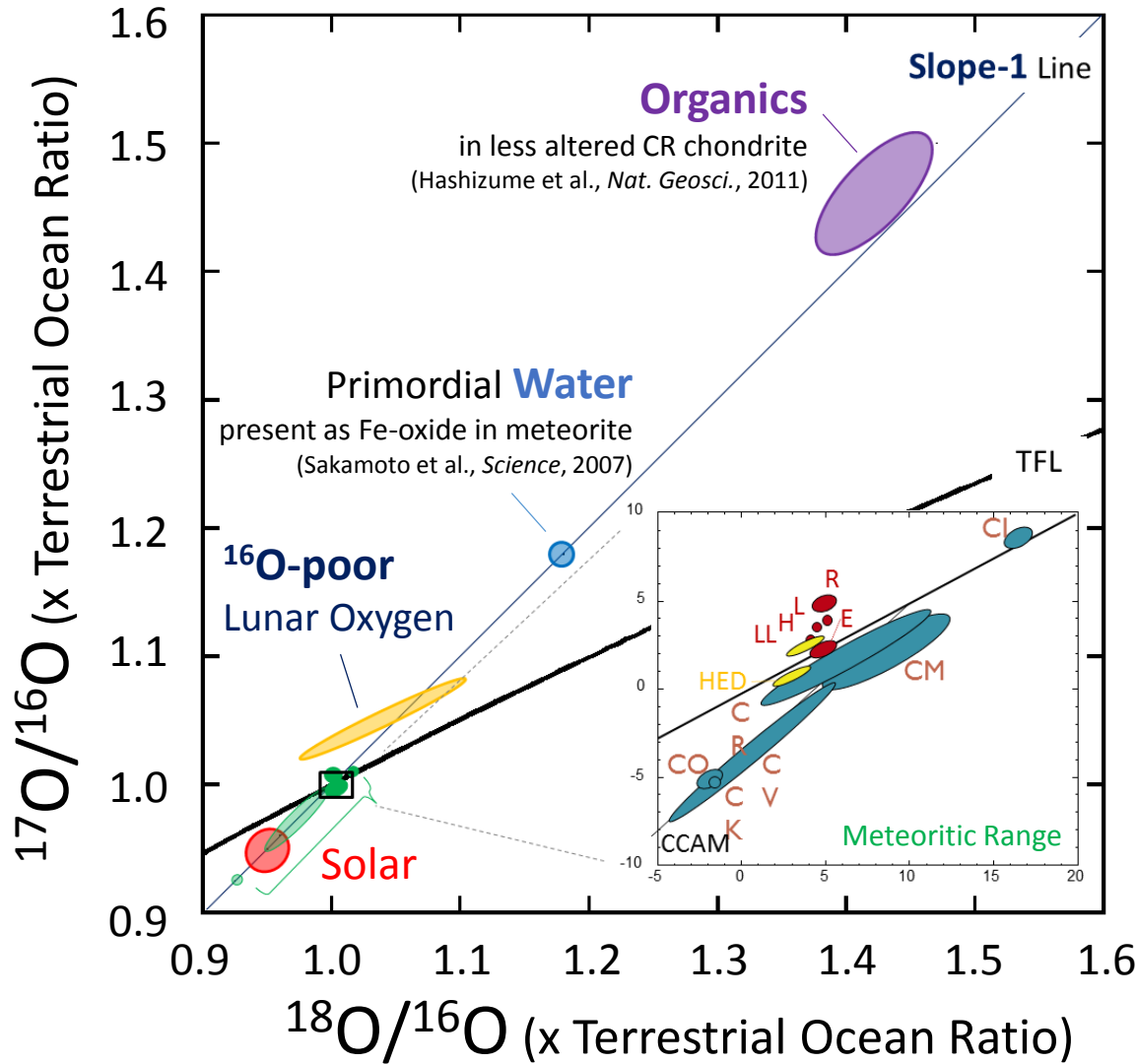


Hashizume et al.,
Science, 2000

A strange ^{16}O -poor Oxygen found at surface of Lunar Metal Grains



^{16}O -poor Lunar Oxygen = Cometary Origin?



Organics & Water:
Analogue for
cometary composition?

Isotopes can accurately determine the origins of volatiles

We may understand:

- Origins of volatiles at Moon polar region.
- Mixing ratios of more-than-one volatile sources.
→ Fluxes of individual sources can be estimated
- Proportions of volatiles carried to the polar region.
(Insights on the migration process)

I propose **on-site measurement of volatile isotopes** at pole.

Optical Instrument:

- Absorption of Infra-Red Laser by Water Molecule.
- Space Mission-proven (ref. Sample-Analysis-on-Mars, Curiosity)
- Sensitive Water Detection, and D/H, $^{17}\text{O}/^{16}\text{O}$ & $^{18}\text{O}/^{16}\text{O}$ measurements.