

# Exogenic origin for the volatiles sampled by LCROSS

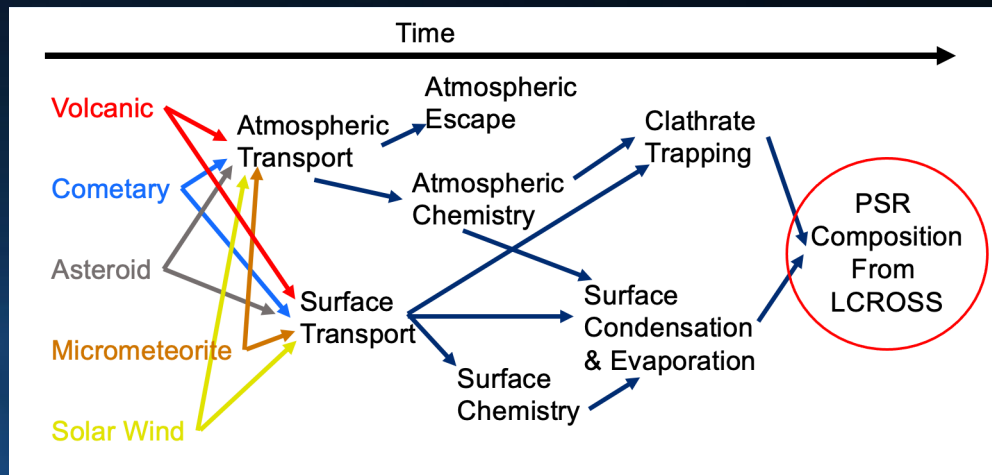


Figure 1 - Connecting current composition of PSR volatiles requires understanding processes that took place between delivery and storage of the volatiles

**Volatiles in the Moon's Permanently Shaded Regions (PSRs) provide a record of the history of volatiles in the Earth-Moon system.**

- The Lunar Crater Observation and Sensing Satellite (LCROSS) impact plume contained water and carbon-, nitrogen-, and sulfur-bearing molecules, but connecting them to sources is challenging (Fig. 1).
- The mixture of sources is determined by using elemental ratios (Fig. 2) and approximating how processes (Fig. 1) fractionate these ratios.
- This model rules out any contribution of volcanic gas to the volatiles sampled, suggesting that any volcanic volatiles present in PSRs must be buried deeper
- We conclude that the source was cometary, suggesting comets were the dominant impactors over the time period of delivery of these volatiles.

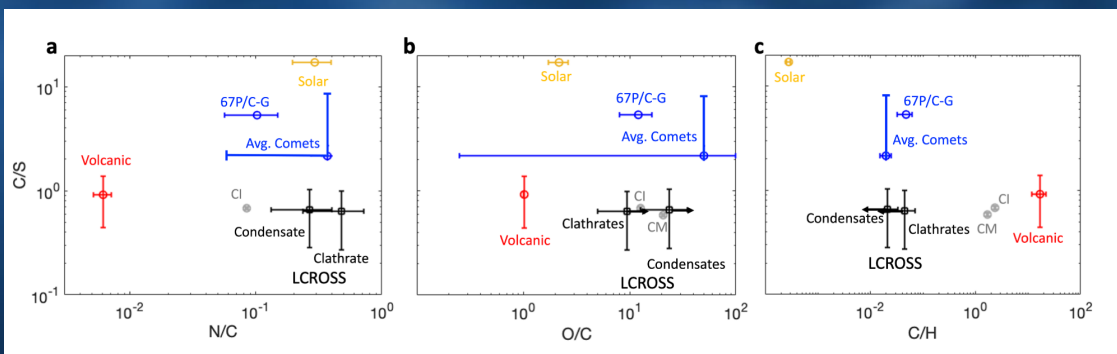


Figure 2 - Comparison of potential source composition with two forms of ice based on LCROSS. Note that no single source explains the observations, so modeling is required to determine the mixture of sources and if fractionation took place.