Theories of Water on the Moon

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Theories of H-Storage on the Moon

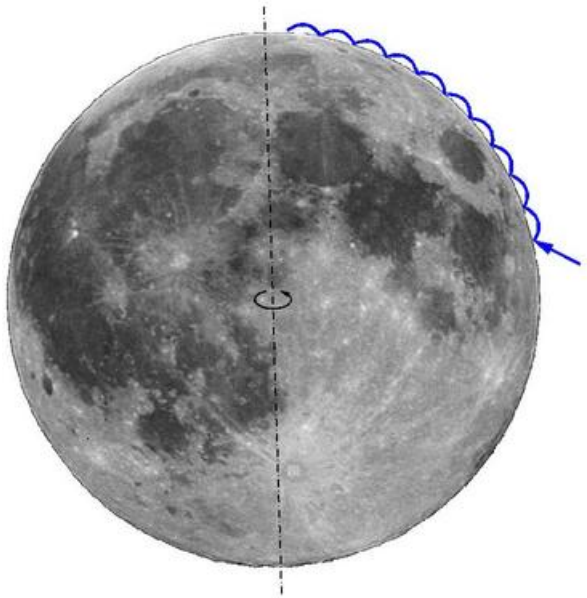
Theory	Sub-theory	Comments
Negligible sublimation at low temperature	*Watson-Murray-Brown* (WMB)	classic theory (1961a,b)
	Buried ice	
	Small shadows	
	Single-source	unequal filling of cold traps
Adsorption		enough H_2O?
Ice Pump		enough H_2O?
Degassing-limited solar-wind implanted H		*Starukhina* (2001, 2006) no H_2O

Theory	Relevant Variables
Watson-Murray-Brown	T
Small shadows	T
Buried ice	T + diffusivity (grain size)
Single-source	T + source location
Adsorption	T + specific surface area (grain size)
Ice Pump	T + diffusivity (grain size)
Degassing-limited solar-wind implanted H	T + material properties

Conclusion: After temperature (T), grain size may be the most important variable that determines the presence of water.

Theories of Water Transport on the Moon

Watson-Murray-Brown (1961)	Hodges (2002)
Ballistic hops at thermal speed	H_2O chemisorbes on silicate surfaces; no thermal hops
Efficient lateral transport	Little or no lateral transport



Conclusion: Efficiency of lateral transport is unknown.

Note: Hop distance is much larger than any cold trap –> uniform filling expected

Major Questions

- What physical effect accounts for the majority of H_2O or H on the Moon? (~7 theories have been proposed + ?)
  - No theory is fully satisfactory
  - Classic effect (shadows cold enough for ice) overpredicts area. There appear to be unfilled PSRs. Why?
  - 3 of 7 theories depend directly on grain size
- Is there efficient lateral transport of H_2O on the Moon? (uncertainties due to the physiochemical interaction of H_2O with space-weathered silicate surfaces)