

CONTROL ID: 2254184

TITLE: Water on the Moon

ABSTRACT BODY:

Abstract Body: After years of thinking the Moon is dry, we now know there are three ways in which water appears on the Moon today:

1) The hypothesized buried deposits of volatiles at the lunar poles were found at Cabeus crater. There are questions about the origin of such volatiles (i.e., in-falling comets & meteorites, migrating surficial OH/H₂O, and accumulated release from the interior), but there is no doubt the water is there. This long suspected polar water was the most recent form to be confirmed on the Moon.

2) Widespread, thinly- distributed, surficial OH (or H₂O) is the most recently formed lunar water, and its discovery was completely unexpected. It occurs across all types of lunar terrain, but is more difficult to detect in the warmer equatorial terrain where thermal emission is strongest. The consensus is that this OH is indeed derived from solar wind H linked to O from the surface silicate rocks. Although pervasive, we don't know how quickly it forms, nor how mobile it is.

3) The amount of water present when the Moon formed is now documented in lunar materials from Apollo samples (preserved in the lunar mantle material found in volcanic glass beads). Sample analyses made during the Apollo days were not sufficiently precise to distinguish between indigenous lunar water and terrestrial contamination.

Measurements with modern equipment are not only more precise (both elemental and isotopic), but can be made in a manner to constrain a host of processes (e.g. diffusion, thermal cycling) that have acted on these samples during their residence on the Moon. The mysteries associated with all these 'water' forms are being pursued by teams and scientists around the world. The paradigm-shifting work that reported these discoveries in recent years are from: the NASA LCROSS (lunar impact mission) team (2010), M3 team/ on the Indian Chandrayan Mission (2009), and lunar sample chemists (2008). NASA Lunar Reconnaissance Orbiter, GRAIL, ESA Smart-1, Japanese Kaguya, and other missions have further revolutionized our understanding of the geochemical and geophysical evolution of our neighbor. Ongoing analyses are informing a number of hypotheses and theories about the connection between the Earth and its "wet" Moon.

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