

ASTRO PHYSICS SCIENCE RESEARCH: WATER ON THE MOON***Lie Chun Pong**Received 17th September 2025; Accepted 20th October 2025; Published online 28th November 2025

Abstract

“If humans plan to send astronauts to the Moon or establish a permanent settlement, water will be a vital resource.” In the past, there has been a little evidence supporting the idea that liquid water once flowed on the surface of the Moon. This research paper provides new insight for this issue. By the data provide by the NASA and China Sight [1][2][3], this research estimates (projection) that liquid water may existed on the Moon over 4 billion years ago. Which is the Moon somewhat resembles the early Earth, with an atmosphere and oceans present. However, due to the disappearance of the atmosphere, the extremely low air pressure and water vapor content made it difficult for liquid water to exist stably, and some of the water was lost to space. While this research study suggested that water was preserved in the form of ice caps beneath the Moon due to the heavy bombardment before, this research suggests this is sufficient to explain where the water travels through the crack and is trapped, which becomes Moon ice.

Keywords: Ice liquid water, Bombardment, Crakment-ship, Moon ice.

INTRODUCTION

Earthquakes and meteorite impacts on the Moon produce seismic waves that can help map the interior of the planet. Seismic waves generated by lunar earthquakes and meteorite impacts provide critical data for probing the Moon's internal structure. This study examines the analysis of sea wave segmentation resulting from seismic activity caused by extraterrestrial impacts, as detected by NASA and ChiSight instruments [1][2][3]. Similar seismic phenomena have been observed on Mars, as detected recently by ChiSight. Regarding the Moon, it is hypothesized that various seismic wave modes propagate within its interior, suggesting heterogeneity in the lunar crust. Beneath the lunar surface, particularly on the far side, there may exist subsurface liquid or ice formations. The Moon's formation remains an unresolved scientific mystery; however, it is well-known that the far side of the Moon perpetually faces away from Earth into dark space, while the near side is constantly visible from Earth. This tidal locking influences internal dynamics. Observations suggest potential structural heterogeneity beneath the lunar crust, possibly resulting in variations in rotational dynamics. Such anomalies may indicate the presence of a core region composed of trapped liquid or ice, which could be responsible for internal mass distribution and seismic responses, offering clues to the Moon's geophysical evolution.

We believed that this imbalance of movement caused the Moon to have a direct shift angle billions of years ago. According to the latest images of the Moon, we discovered many holes that resemble ball-shaped effects, which hit the Moon. With a bit of imagination, we can think of these rocks from outer space hitting the Moon and causing eruptions similar to cracker explosions. In these craters, seawater on the Moon's surface might spill into the caves inside due to the heavy bombardment from space. Many scientists believe there may have been an ocean on the Moon before, but as the magnetic poles cooled down, the Moon's atmosphere could have dissipated when the Sun's protons continuously struck its surface, causing the gases to vanish and vaporize the lunar ocean.

This research paper postulated that when a high-velocity impact event occurs on the lunar surface, it could generate a localized fracture or crack within the regolith or underlying basaltic layers. Such a fracture might serve as a conduit, allowing subsurface liquid water possibly residual from lunar volcanic activity or cometary delivery to percolate into the impact crater zone. This process could lead to the formation of transient or persistent pools of liquid water beneath the lunar surface.

Additionally, these trapped ocean waters may turn into ice due to the weather conditions on the Moon. This paper suggests that the Moon may contain liquid similar to ice-liquid water, which is trapped along with energy gases. These gas energies could be contributed by the massive pressure from the Moon's surface, suppressing them. Based on the latest pictures of the Moon [1][2][3], we can observe ocean-like patterns. These patterns might be hints of ocean river deltas, which could be supporting evidence for this research. The presence of ancient river water links may further support the idea that the Moon once had water oceans. Moreover, due to the spin effects and crack formations, this liquid water could be trapped inside the Moon by fissures, creating an imbalance. Some of these ice deposits may be filling the backside of the Moon, implying that water might be present beneath its surface. Additionally, phenomena on the Moon are similar to conditions on Mars. Seismic waves and unmanned probes have revealed that Mars has areas of pores and fractures filled with liquid water deep inside. These underground water reserves are sufficient to form an ocean covering the entire planet, suggesting that Mars once had an environment capable of supporting life.

There are sufficient reserves to create an ocean that could cover the Moon before

This paper collected more than 2 Moon Martian data sets from NASA and China Sight [1][2][3] between 2000 and 2024. We analyzed the data and estimated that 12.5 to 16 kilometers below the Moon's surface. There may be a large liquid reservoir, which far exceeds the amount of water previously thought to have existed in the Moon's surface ocean. It is enough to cover the entire Moon, with water depths reaching

0.2 to 0.8 kilometers. Although these groundwater resources are too deep to be mined, this aquifer could serve as a "refuge" for energy gas to exist.

Rivers and lakes existed billions of years ago in the Moon

Based on the data above [1][2][3], it is believed that this liquid water originated from rivers and lakes that existed on the Moon billions of years ago and seeped into the ground through cracks in the rocks. In planetary theory studies, at such depths, the Earth's crust is warm enough for water to exist in liquid form, while at shallower depths, water freezes into ice. This research suggests that the discovery of liquid water could indicate the possible existence of life or micro-life on the Moon, if water exists, whether in the past or present, and could provide conditions conducive to supporting life by microorganisms. Since there is life found in deep mines and on the seafloor on Earth, the deep underground aquifers of the Moon may also have a high likelihood of harboring life.

Extensive evidence [2][3], such as river channels, deltas, and lake sediments, suggests that liquid water once flowed on the Moon's surface in earlier times. This idea is well supported by our hypotheses, indicating a wetter period that ended over 4 billion years ago when the Moon lost its atmosphere. Additionally, recent research [1][2][3] indicates that most of the water on the Moon did not escape into space but instead seeped into its crust. It is similar to the situation on Mars before.

"ChinaSight" [3] landed on the Moon's surface with a seismometer in 2021. It was the first instrument to detect the Moon's far side, and it discovered that there may be earthquakes on the Moon. On November 21, 2021, the China Aerospace Agency announced the end of the "ChinaSight" mission. By analyzing seismic data collected by ChiSight [4], this research paper's purpose is to suggest that moonquakes may cause leakage of the Moon's surface water into its interior. Our suggestion is well supported by the China-sight moon mission discovery.

China-Sight [3] moon mission collects data in two modes: a "burst mode" when it passes over seismically active regions, and a "survey mode" in other areas. Its instruments detect electromagnetic variations that could be related to earthquakes. The data may support our research paper's suggestion that moonquakes could cause leakage of the moon's surface water into its interior. Our innovative ideathat moonquake-induced water leakage into the moon's interior is behind certain phenomenawas confirmed by China-Moon-Sight instrument measurements [3], linking space observations to seismic activity. This research also suggests that water leakage occurs in the moon's ocean, caused by moonquake activity. The water may be seeping into cracks and caves on the moon, acting as a large ice water reserve within it.

Furthermore, it is hypothesized that a substantial ice cavern exists within the lunar polar region, potentially concealed behind a heavily cratered surface. This inference is supported by historical evidence of intense bombardment events, which likely caused extensive melting and vaporization of lunar oceanic water reserves. A significant portion of this water could have migrated and become trapped within subsurface fracture networks of the lunar far side. The presence of

numerous tectonic cracks and faults suggests these structures may serve as repositories for an icy mantle, leading to an accumulation of volatiles behind the crustal fractures. This distribution of subsurface ice may account for the observed slight obliquity variations, as the uneven mass distribution influences the Moon's rotational dynamics. Detailed data concerning the thickness of the lunar crust, the internal structure and composition of the core, and temperature gradients within the mantleobtained from recent Chinese lunar missions such as Chang'e-4 and lunar radar tomographyare crucial for elucidating the Moon's asymmetric face orientation. These insights will facilitate a more comprehensive understanding of the Moon's geophysical anomalies, thereby substantiating the theoretical framework and predictive models proposed in this study.

Additionally, this paper infers that, due to the imbalance of bombardment, on the North face of the Moon, the cracks will develop differently. This variation may affect the distribution of ice, with some ice containing gas inside and others being pure water. The hardship caused by the uneven bombardment will create different pressures inside the Moon, leading to varied patterns of ice distribution and gas presence within the lunar ice. Furthermore, when considering the entire Moon, including the far side, this paper suggests that the Moon may have a Maltese cross-like structure, where some areas are formed as liquid ice, and others are composed of ice within cracks or caves. This similar Maltese cross structure inside the ice of the Moon, supported by evidence from ChiSight [3][4], indicates that such a pattern, with cracks and fragments, could result in water filling these cracks and affecting the overall ice distribution. Additionally, this vapor could cause the Moon, like ancient Maltese crosses, to become dry on the surface while ice accumulates inside the Moon's cavities.

Moreover, with utilization from the picture by NASA's [5] and China-Sight images [6], this paper strongly suggests the presence of liquid water deep below the surface of the Moon. By monitoring moonquakes, this research paper confidently inferred the presence of liquid water at depths of 5 to 8 kilometers below the surface. This paper believes that the Moon lost its surface water over billions of years, leading to its current dry and dusty state till now. But some of the water has become trapped in the crack, which becomes the ice stage. This research reasonably believed that such assertions in ancient water may have either escaped into space or remained on the backside of the moon. This groundbreaking assertion robustly supports the existence of water and merits an intensive search for potential signs of microbial life on the Moon.

In conclusion, this study posits that liquid water previously existed on the lunar surface, supported by new insights into the geophysical and mineralogical conditions of the Moon. We assert with confidence that liquid water persisted on the lunar surface more than 4 billion years ago, during a period when the Moon's environment was more akin to Earth's, characterized by a transient secondary atmosphere and episodic hydrographic activity. The subsequent loss of the lunar atmosphere, likely due to solar wind stripping and thermal escape, led to the sublimation and evaporation of surface water, with some of the escaping volatiles vented into the lunar exosphere. This research suggests that residual water could be sequestered within fracture networks created by hypervelocity bombardment, with some residual volumes becoming

entrapped within the subsurface regolith and cryogenic ice deposits at depth beneath the crust. This model accounts for the detection of hydrated minerals and potential ice deposits within permanently shadowed lunar craters. Supporting data from NASA's Lunar Reconnaissance Orbiter and China's Chang'e missions further corroborate this hypothesis. Furthermore, we hypothesize that microbial life or biosignatures could potentially exist in subsurface aquifers or within hydrated mineral matrices, considering water's essential role in biochemistry. We hope this research advances our understanding of lunar hydrology and astrobiological potential, contributing valuable insights to planetary science and humanity's exploration efforts.

REFERENCES

1. NASA's Artemis program and the Lunar Water ISRU Measurement Study (LWIMS) aim to measure and model lunar water deposits. Their goal is to assess the feasibility of using in-situ resources for future lunar bases, including identifying mining sites, estimating quantities, and determining extraction needs.
2. Since 1997, various space missions like Mars Odyssey (2001) and Mars Express (2003) have provided detailed data about Mars and its moons. The Japanese MMX mission, launching in 2024, plans to gather samples from Phobos. These missions offer a wealth of scientific information on Mars and its moons from 2000 to 2024.
3. China launched the Chang'e lunar program, with the Chang'e-6 mission targeting a sample return from the Moon's South Pole-Aitken Basin on the moon's far side. Earlier missions included Chang'e-4, which was the first to land on the Moon's far side.
4. CSES China-sight moon mission gathers data in two modes: a "burst mode" when it passes over and seismically active regions, and a "survey mode" in other areas. Its instruments detect electromagnetic variations that could be related to earthquakes, supporting our research paper's suggestion moon earthquakes may cause leakage of the moon's surface water into the moon's inside capsule. Our innovative discovery mechanism behind, was well supported by the discovery in the China-sight mission.
5. NASA's Artemis program and LWIMS measure lunar water deposits to assess their potential for in-situ resource utilization, including mining locations, quantities.
6. China-sight moon mission gathers data: Connecting space-based observations with seismic activity. The satellite functions within geomagnetic latitudes from -65° to $+65^{\circ}$ and seismic zones.
