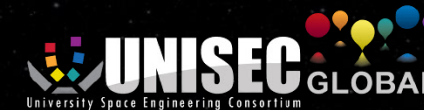




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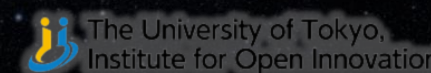


LWISAT

ルイサット

Lunar Water Index by Spectral Measurement through a
CubeSat Constellation

Sofía Alvarado, Johan Carvajal, Héctor Gómez, Jose María Jiménez, Eduardo Leandro,
Kimberly León, Karina Matarrita, Antony Ramírez, Karolina Herrera.



Water is one of the most valuable and threatened resources for life.

- Countries were in conflict due to water access.
- Essential in various industries and processes.
- Agriculture (60% of jobs for Central America and the Caribbean).



Water is one of the most valuable and threatened resources for life.

SDG6: Clean Water & Sanitation

Targets:

- Implement integrated water resources management at all levels.
- Expand international cooperation to developing countries in water-and sanitation related activities.



Water is one of the most valuable and threatened resources for life.

“...by adapting to the water effects of climate change, we will protect health and save lives. And, by using water more efficiently, we will reduce greenhouse gases.”

-WHO, 2020



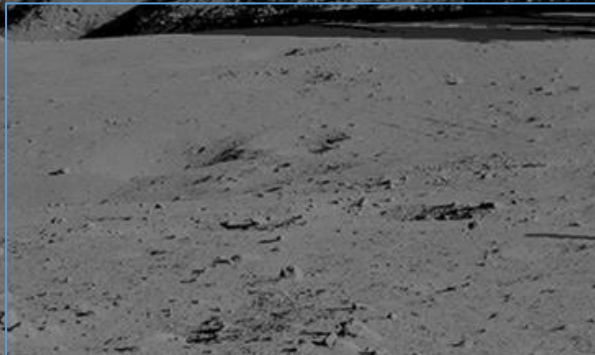
World Health
Organization

ARTEMIS PROGRAM



A new era for deep space exploration.

- First step to prepare for missions to Mars.
- The Artemis Base Camp.



ARTEMIS PROGRAM



- Lunar Orbital Platform-Gateway (LOP-G).



MISSIONS RELATED

• SOFIA.



Source: NASA©

• Chandrayaan-1.



Source: ISRO©

• LCROSS.



Source: NASA©

• LRO



Source: NASA©

• Lunar Flashlight

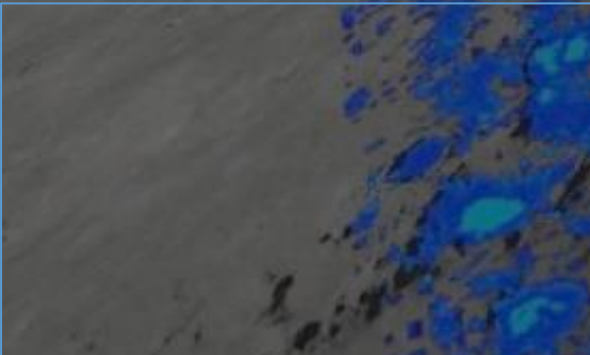


Source: NASA©

• LADEE



Source: NASA©



How much water is there and where
is it located on the moon?



LWISAT MISSION

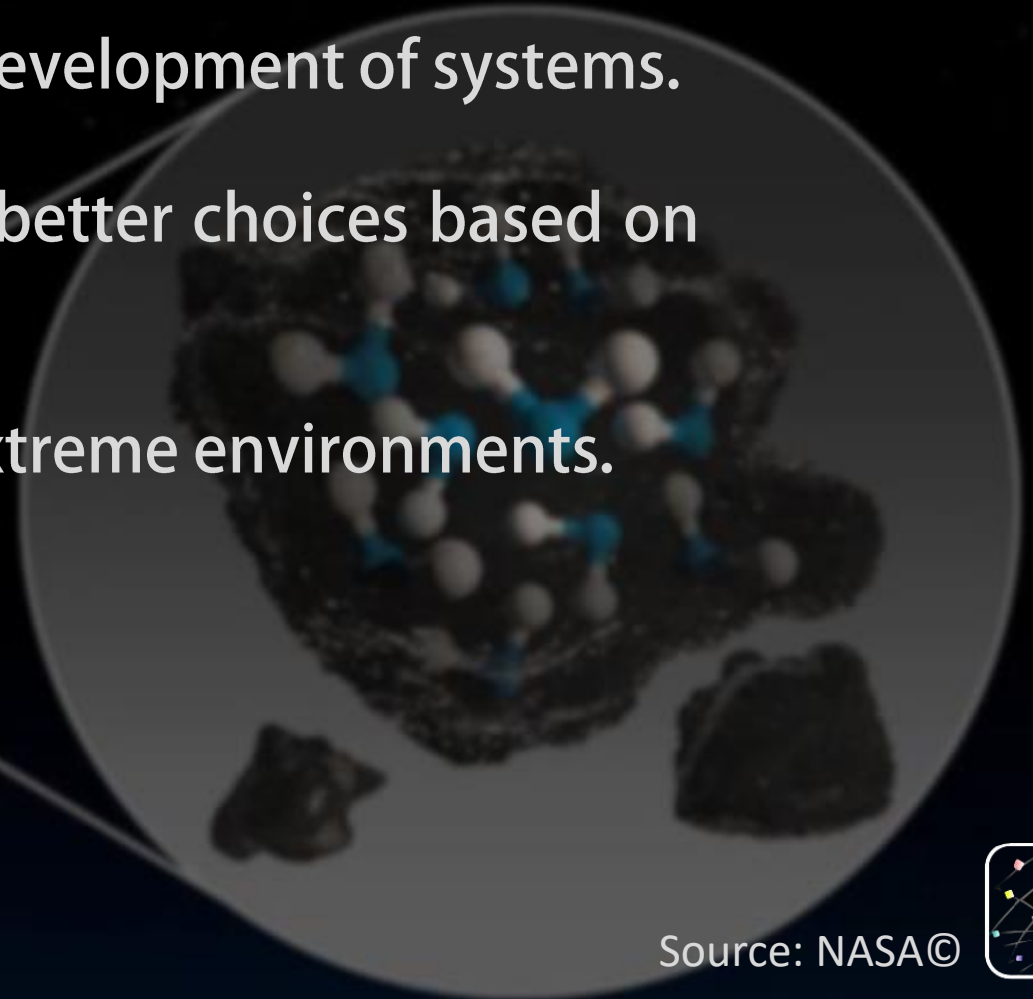
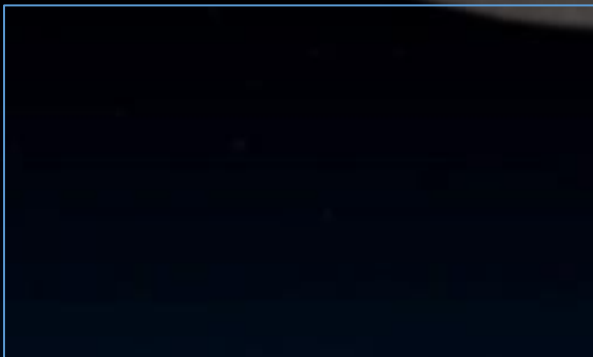
Identify and quantify water on the moon poles through a cubesat constellation featuring spectral measurement instruments.



WHY OBTAIN WATER DATA FROM THE MOON?



- Beginning of research and development of systems.
- Provides the tools to make better choices based on quantifiable facts.
- Opportunity to anticipate extreme environments.



Source: NASA©



MISSION OBJECTIVES



GENERAL OBJECTIVE

Develop a remote sensing water index supplied by a 5 nano-satellite constellation deployed in a lunar orbit.



MISSION OBJECTIVES

SCIENTIFIC OBJECTIVES

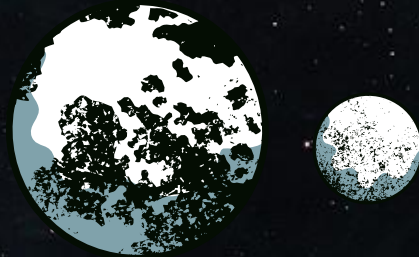
- Acquire the data to generate a lunar water index, in order to decrease the cost of exploration and analysis and increase the precision in multiplanetary and mining missions.
- Deliver a baseline for high-quality spectral band diagrams of different potential water deposits located in the Moon.



MISSION OBJECTIVES

ENGINEERING OBJECTIVES

- Validate the correct operation of the optical sensor for replication and usage in future deep space exploration missions.
- Provide databases to support deep space exploration research and enable better decision making for companies, universities, governments and space agencies around the world.



IMPACT ON SOLVING PROBLEMS



- Implemented in developing countries.
- Inspiration for the new generations
- Central America with potential to develop aerospace projects.
(Costa Rica launched their first satellite, and so did Guatemala two years later).



Source: ACAE©/TEC©



Source: UVG©



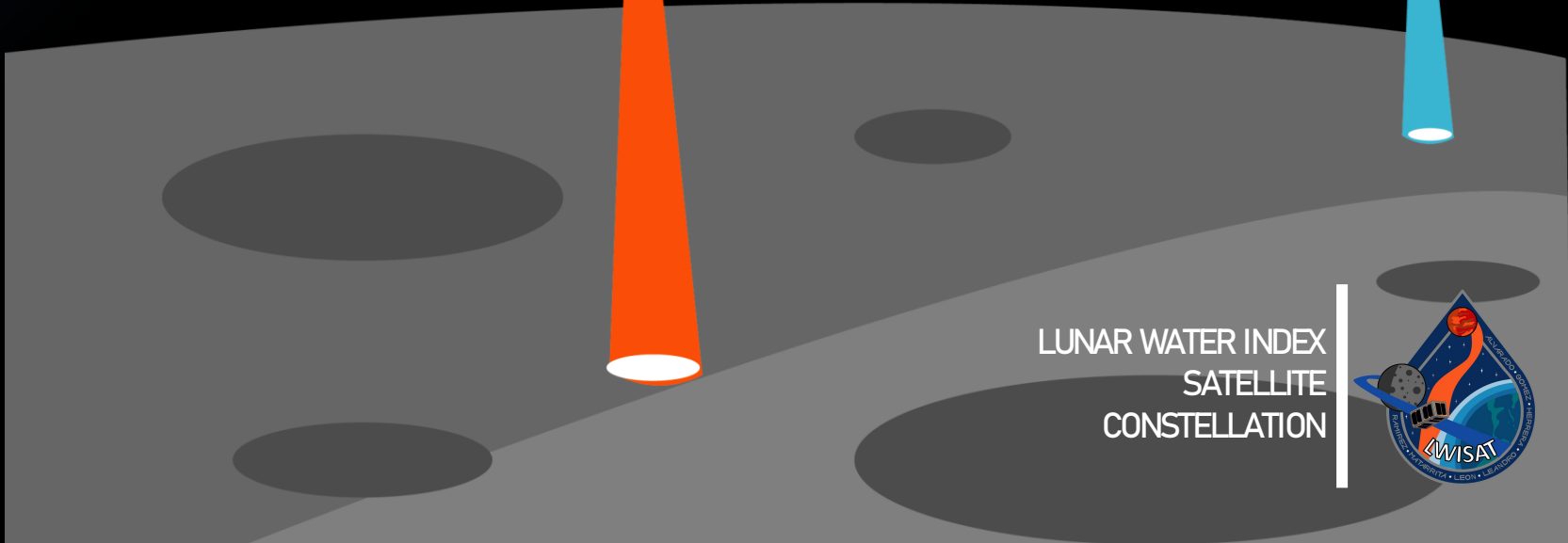
SPACECRAFT DESCRIPTION

Lunar Gateway (LOP-G)

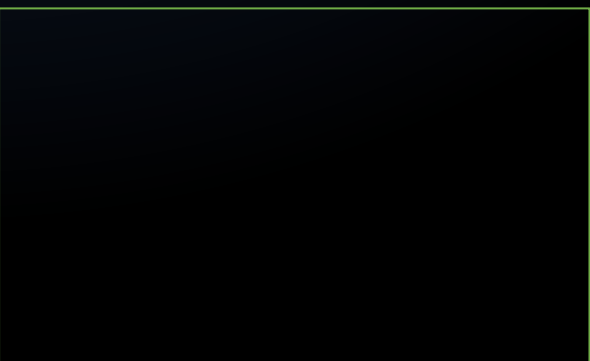
SC5_M

SC3_C

SC1_D



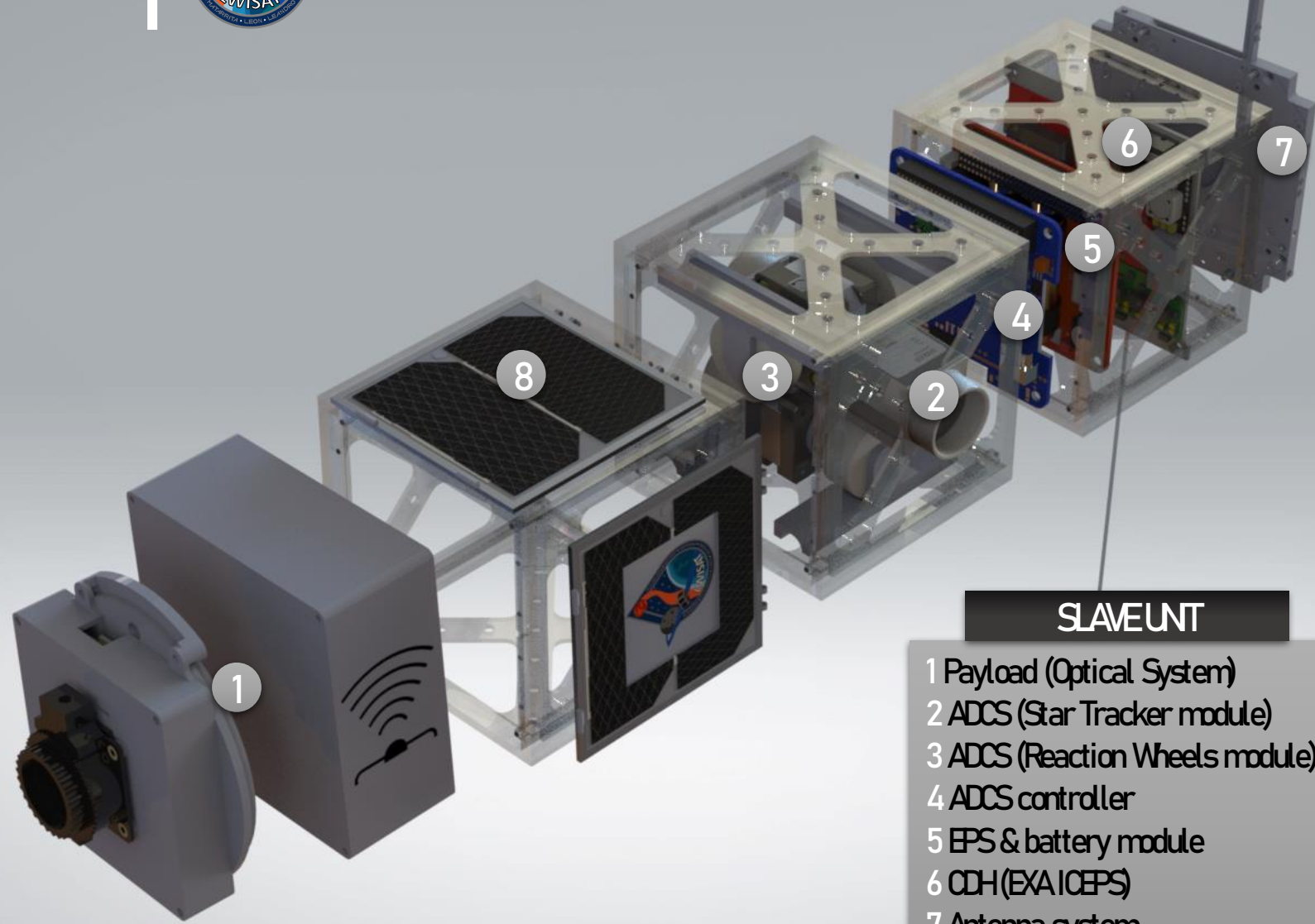
LUNAR WATER INDEX
SATELLITE
CONSTELLATION



SPACECRAFT DESCRIPTION

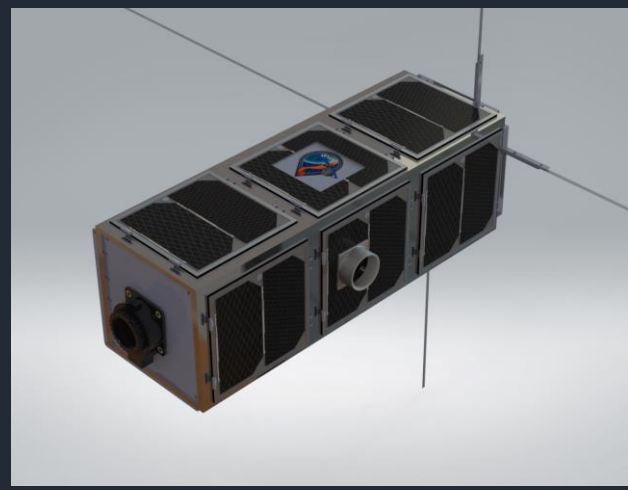
- Electrical power
- Communication
- Data handling
- ADCS
- Protection systems.



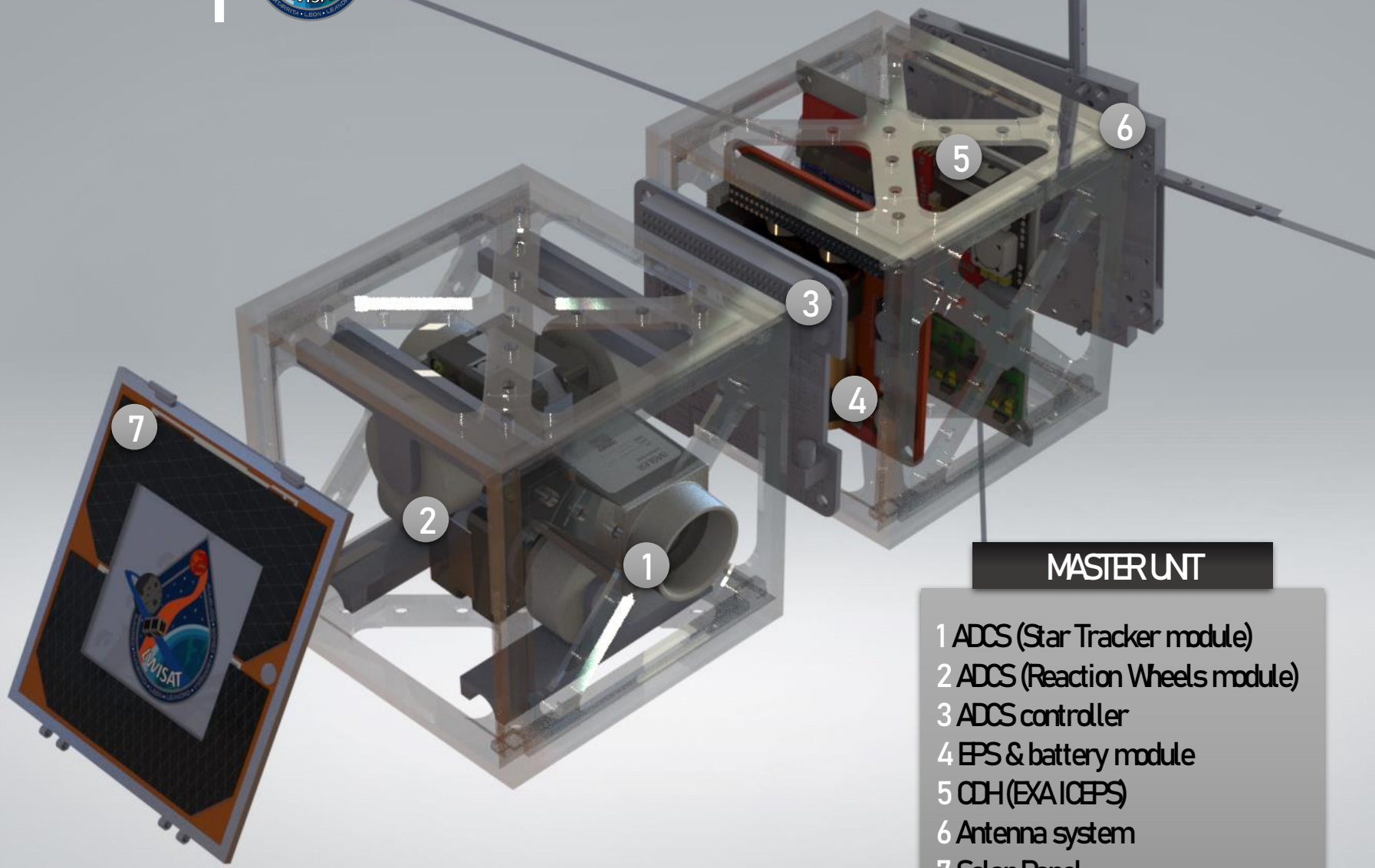


SLAVEUNT

- 1 Payload (Optical System)
- 2 ADCS (Star Tracker module)
- 3 ADCS (Reaction Wheels module)
- 4 ADCS controller
- 5 EPS & battery module
- 6 CDH (EXA ICEPS)
- 7 Antenna system
- 8 Solar Panel

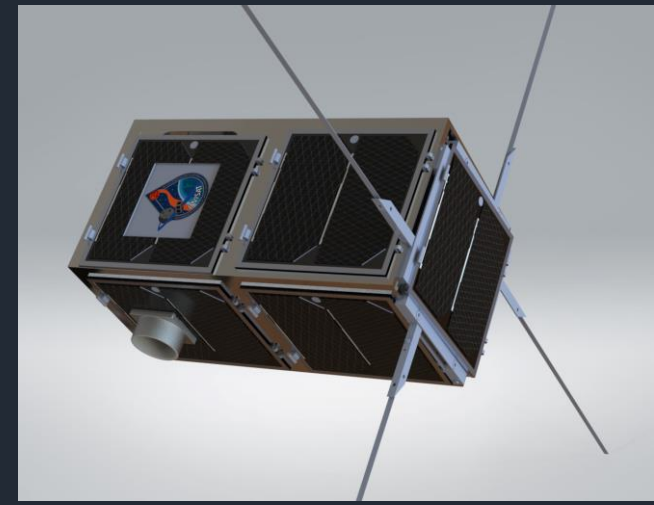


LUNAR WATER INDEX
SATELLITE
CONSTELLATION



MASTER LNT

- 1 ADCS (Star Tracker module)
- 2 ADCS (Reaction Wheels module)
- 3 ADCS controller
- 4 EPS & battery module
- 5 CDH (EXA ICEPS)
- 6 Antenna system
- 7 Solar Panel





OPTICAL SYSTEM

Requires 2 payload systems



UV-IR

Bathymetric LiDAR



HYBRID OPTICAL MEASUREMENT

Scenarios:

- **Illumination surface:** infrared spectrometer capable of penetrating the surface of the moon. **Range change surface:** a UV-IR hybrid deuterium halogen spectrometer, capable of detecting and determining the water index in liquid deposits and powder-ice reaction with U-V radiation.
- **Dark surface:** an ultraviolet laser with a spectrometer in the system capable of detecting dust, ice, and deposits on the moon's surface, in order to map the water in post-processing.



LiDAR RESULTS



Bathymetric requirements:

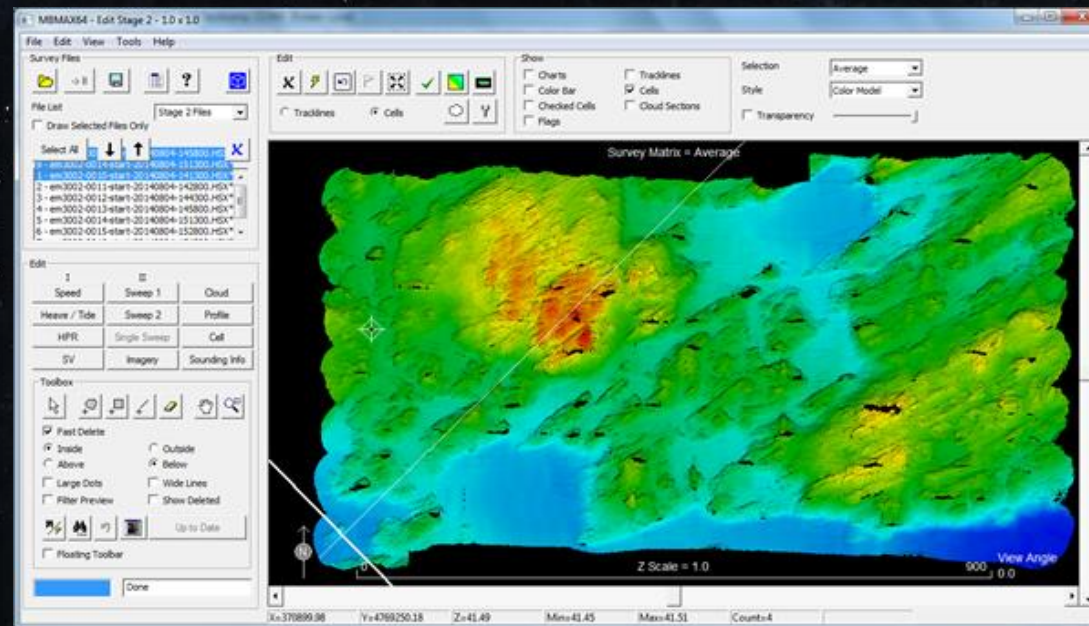
- Gravity waves on the water surface alter the geometry of the laser beam before refraction in the water column. When the laser beam travels in the water column, it undergoes absorption and scattering, causing the laser beam to spread.



To process the data...



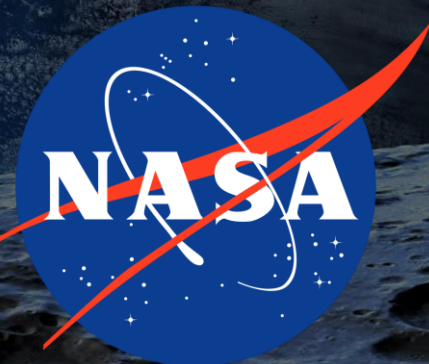
- HYSWEEP MAX software (or any other program with the same characteristics).



HIGH COST MISSION



- Has to operate for at least 18 months.
- Cost Range: 50 000 000 USD to 100 000 000 USD.
- Could be partnered primarily with NASA and supported by JAXA.



Source: NASA©



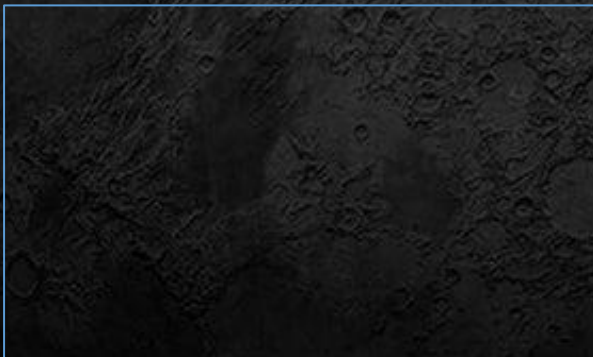
Source: JAXA©



CONCLUSION



- New knowledge and help alleviate social problems on Earth.
- Identify and generate a water index from the water resources located on the moon's surface in order to contribute to deep space science and exploration research.
- It will increase the precision in multiplanetary and mining missions,
 - It will deliver a high-quality spectral band diagrams of different potential water deposits located in the moon.
 - Enables better decision making and provide solutions.

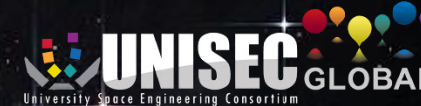




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Thank you so much!

Do you have any questions?

どうもありがとう。

質問がありますか？

Background no copyright Music:

RÜDE - Eternal Youth

wünsche - sunday vibes

SPEECHLESS ☺ - Shangri-La

Elijah Nang イライジャ - Song of the Samurai. 侍

Doze ☺ - drunk off the liquor

