

# In-situ extraction and purification of water on the moon – the LUWEX project

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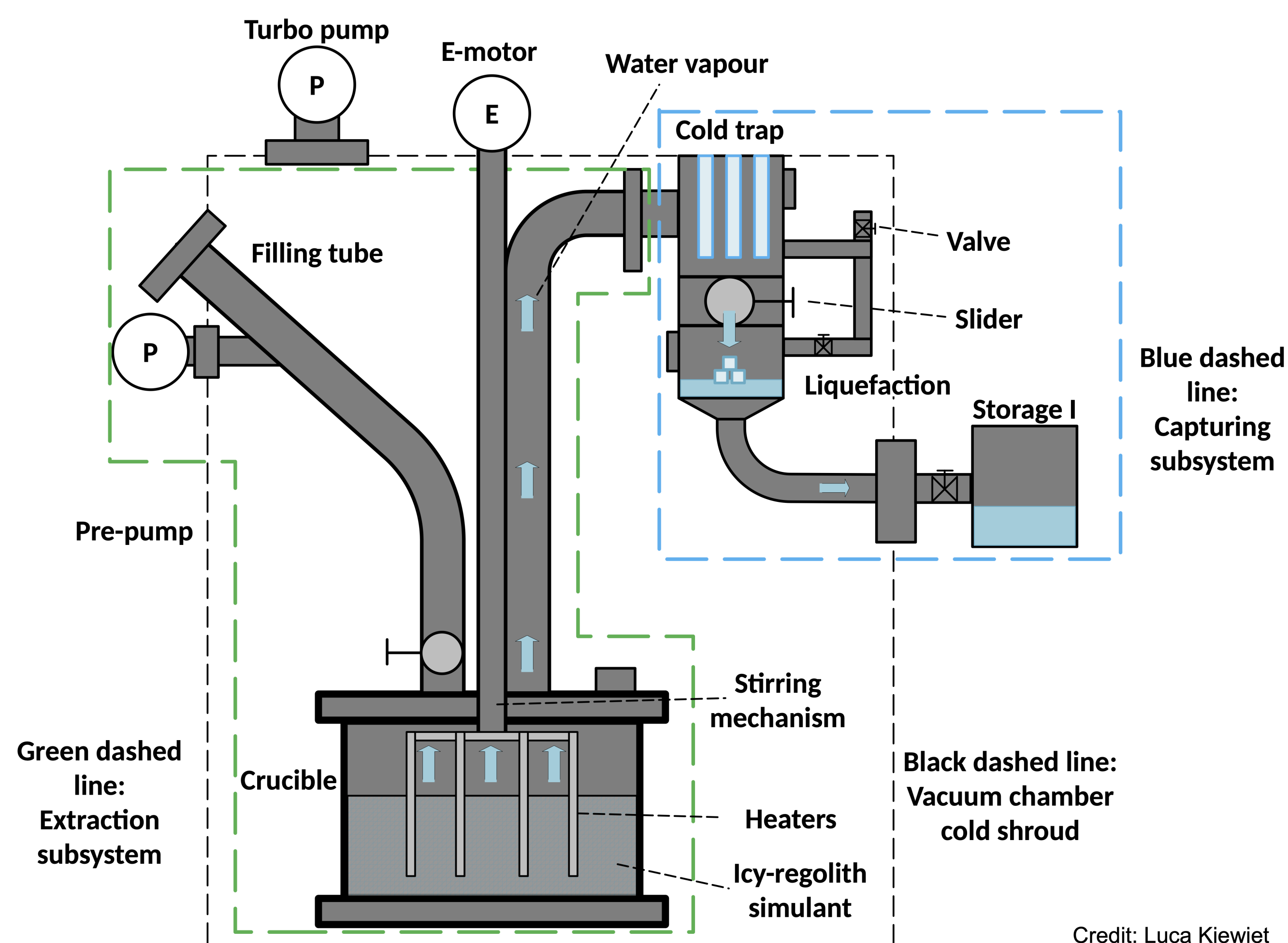
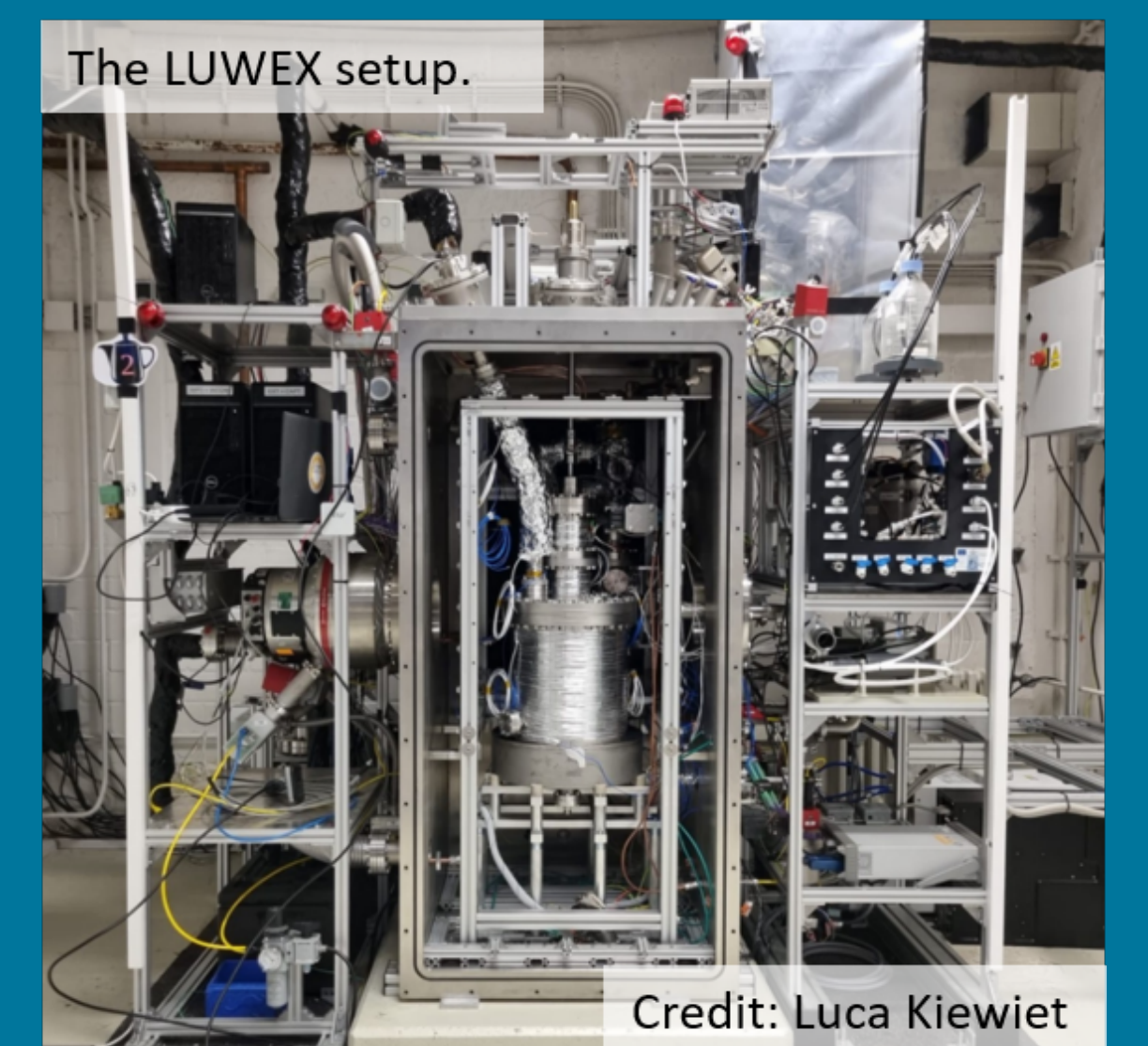
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**LUWEX** (Validation of **L**unar **W**ater **E**xtraction and Purification Technologies for In-Situ Propellant and Consumables Production) aims to develop and validate a technology demonstrator for the extraction of water from icy lunar regolith simulant, the following purification and quality monitoring. The Comet Physics Laboratory's (CoPhyLab) thermal vacuum chamber at TU Braunschweig (Kreuzig et al. 2021) simulates a relevant lunar environment.



The icy simulant is heated in the extraction subsystem, causing the water ice to sublimate. The resulting water vapour flows to the capturing subsystem, where it desublimates. The captured ice is then heated, liquefied, and transferred to a storage tank before entering purification and quality monitoring subsystems.

For the **icy regolith simulant**, granular water ice with mean particle radii of  $\sim 2.4\mu\text{m}$  produced with the ice machine described in Kreuzig et al. 2023 is mixed with lunar regolith simulant. The utilised lunar regolith simulant by Lunex Technologies is a mixture of 75% anorthosite (TUBS-T) and 25% basalt (LX-M), resembling lunar regolith near the south pole. Besides, the water ice is mixed with glass beads with 1.0–1.25 mm diameter. Before the sample preparation, the regolith simulant is heated to remove any absorbed water and enable the realisation of precise mixing ratios.



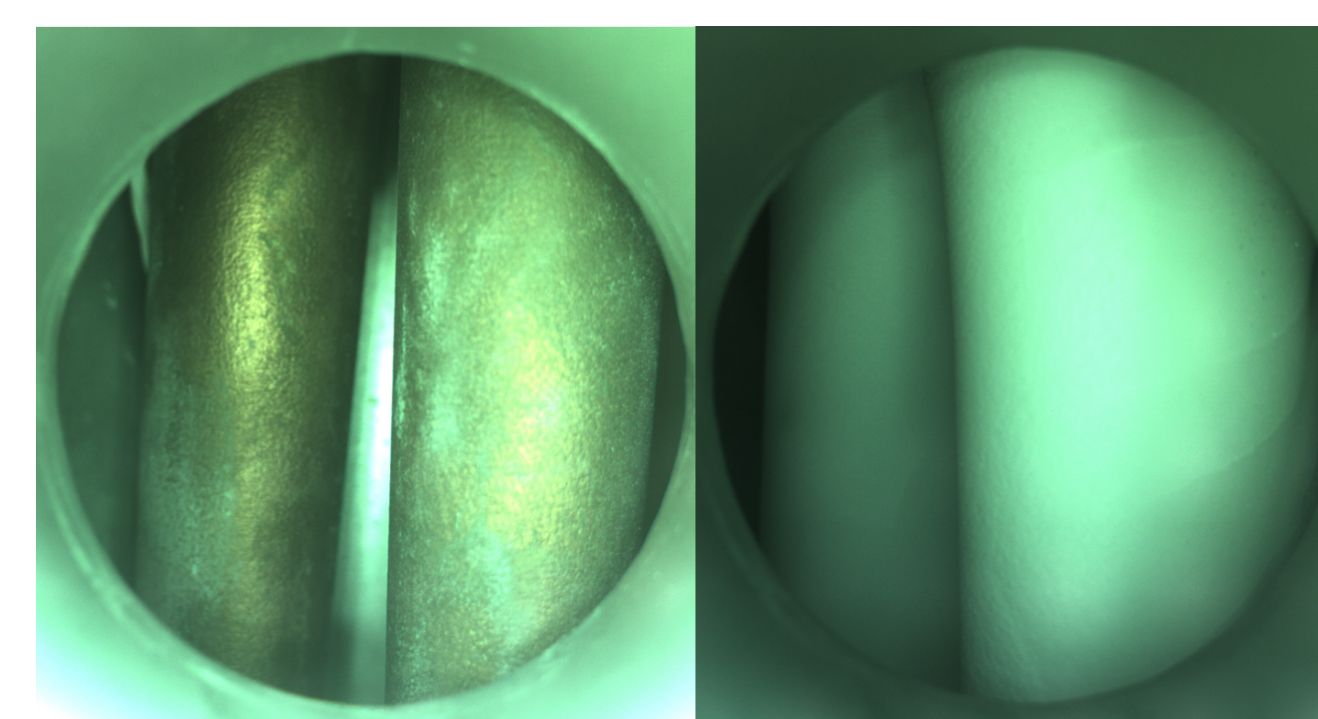
Icy glass beads.



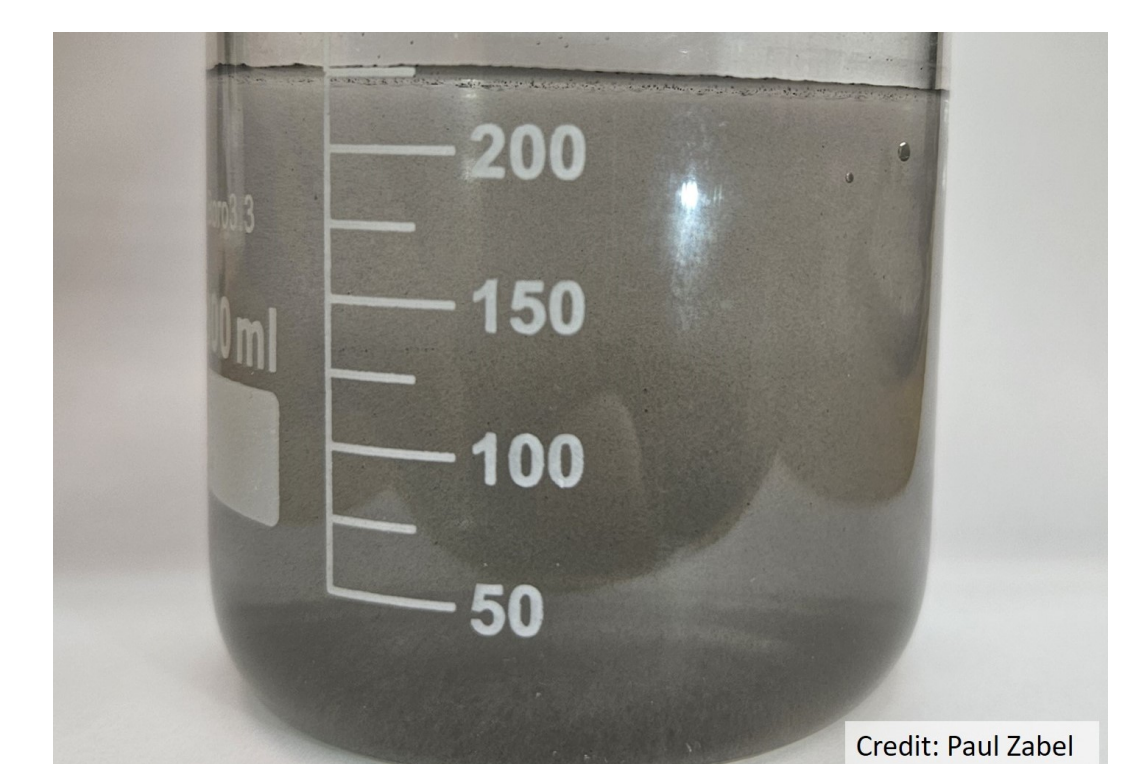
Icy lunar regolith simulant.

## Preliminary Results

- Experiments have been conducted using mixtures of water ice with lunar regolith simulant and glass beads, each containing 5% water ice by mass.
- The water ice can be extracted from the icy simulant by heating and stirring.
- The sublimated water ice can be captured on the cold trap and detached.
- Around 50% of the initial amount of water is extracted from the icy simulant and liquefied.



Cold trap without (left) and with (right) ice.



Water extracted from icy glass beads.