

JAXA Science Highlights

Masaki Fujimoto
Deputy Director General
ISAS/JAXA

Ryugu sample analysis

Hayabusa2 returned samples from the primordial asteroid Ryugu, to address the big question of water and organic compound deliver to proto-Earth that was born dry.



Why Ryugu?

What was the role of C-type asteroids in delivering volatiles to the Earth?



Ryugu sample analysis

- Publication series of the initial analysis campaign has been completed, resulting in ~20 papers in high impact journals
- Presence of hydrated water and organic compound:
Confirmed already during the curation phase
- Six teams for Initial analysis: Revealing the high science potential of the samples, from a dynamic history of an asteroid across the early solar system to organic synthesis inside the small body

Science

\$15
24 FEBRUARY 2023
science.org



SPECIAL ISSUE

ASTEROID SAMPLES

Lab analysis reveals Ryugu's history p. 782



My personal take from the papers

- **CI chondrite**-like elemental abundance

- **Precious**

Most primordial information of elemental abundance of the proto-solar nebula
Ryugu samples of the same nature with little terrestrial contamination

→ A new standard

- **Rare**

Constitutes very small fraction of meteorite collection
Meanwhile, we picked Ryugu because it is one of a few sample-returnable primordial (C-type) asteroid

→ Sampling bias



My personal take from the papers

- **Long range radial migration** suggested by various features

From outside the CO₂ snowline to the inner solar system.

We picked Ryugu because it is one of a few sample-returnable primordial (C-type) asteroid

→ C-type asteroids that went long range migration would not be too special

Comet versus C-type asteroid: Contrast based on meteorite analysis (in which CI-chondrites had little weight) might have been biased towards an exaggeration

New ideas emerging

- **Changing the way to look at C-type asteroids**

Parent bodies of CI-chondrites by far more common than the meteorite collection has suggested

C-type originated in the far outer solar system by far more common than the meteorite collection has suggested

- **Changing the way we curate the samples: Phase2 curation**

Forever-update of sample catalogues

More function to trigger new science themes



Big success. So, what's next?

- Comparative sample analysis: Ryugu versus Bennu
- MMX: Phobos sample return mission

We have been encouraged to plan even beyond MMX:

- A light-weight access to the surface of Mars.



We thought we were catching the wind nicely.
But, then...

Launch failure of our new H3.

- The brand new first stage functioned.
 - The second stage was not ignited.
-
- MMX has been planned to launch in 2024 by H3.

Launch failure of our new H3

- The second stage was not ignited.
 - The second stage is used for H-2A as well.
-
- XRISM+SLIM dual launch by H-2A has been planned to take place soon.

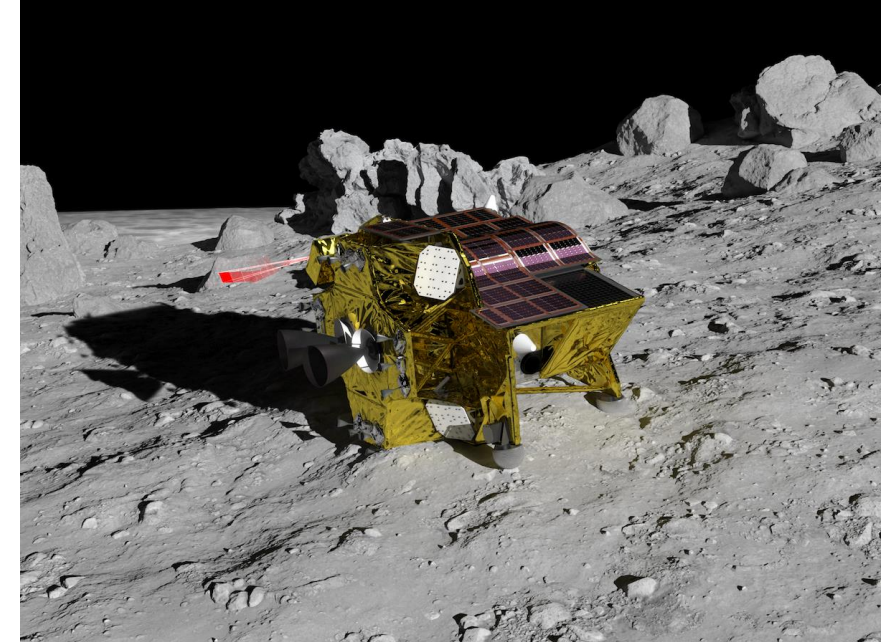
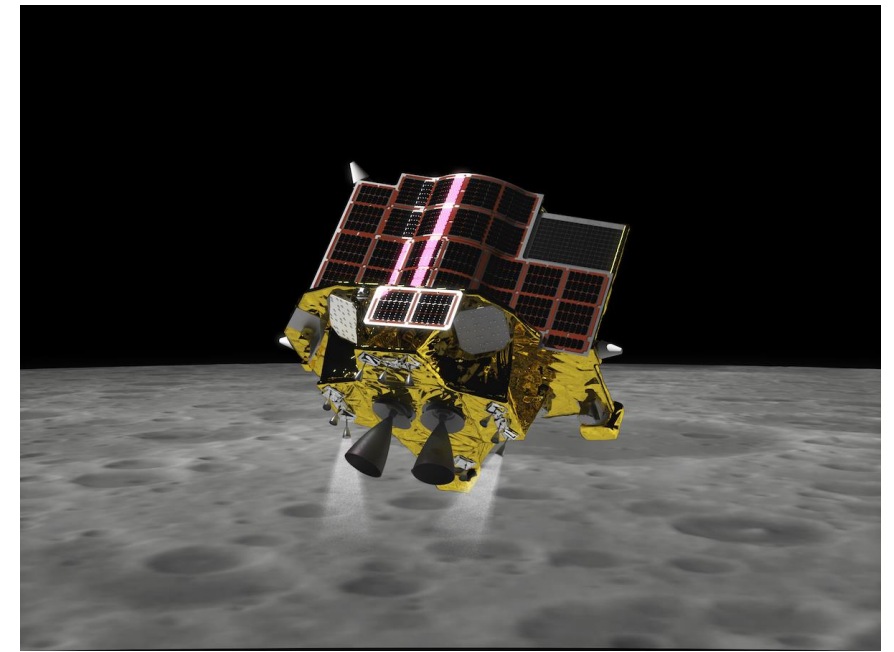
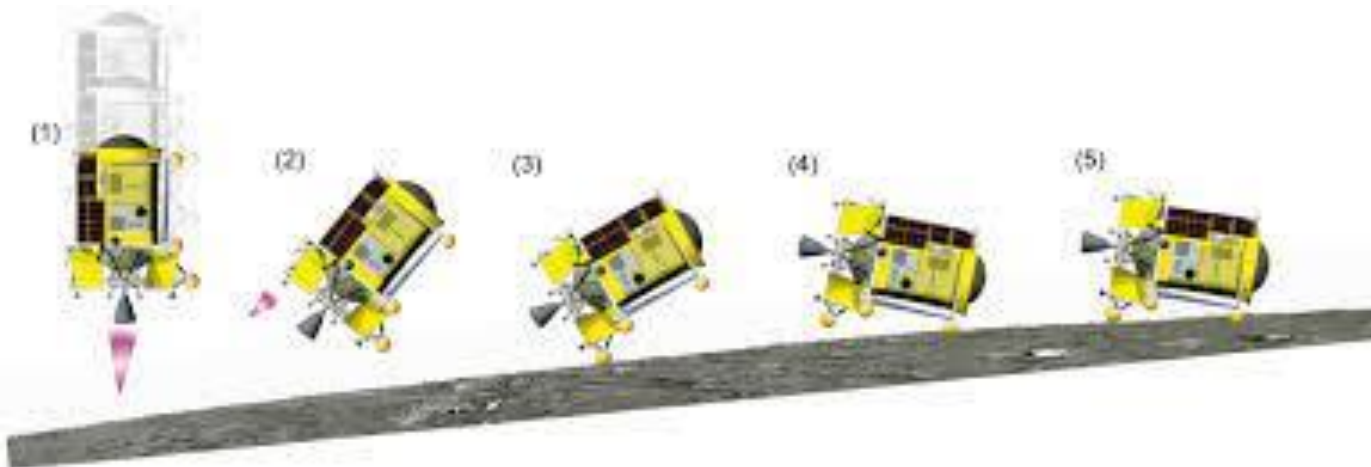
XRISM

- High-resolution spectroscopy in X-ray
- Expected to open a new horizon in X-ray astronomy
- Large-scale Japan-US collaboration



SLIM

- The first step in JAXA's lunar landing program
- Pin-point landing and two-staged landing
- Post-SLIM series will constitute our contribution to ARTEMIS



XRISM+SLIM launch

I could have received good news last week, but I did not.

Too bad that these nice missions that are ready to go will very likely have to be delayed.

Sorry for the embarrassment, but my intention here is to maintain the transparency.

We will make use of the time that became available due to the temporary setback to make ourselves fully ready when we will be back on the track.