# JAXA's Activities for Planetary Defense

**Updates since the last 24th SMPAG**


**Oct. 9, 2025@Online**

**JAXA Planetary Defense Team**

# JAXA's activities for planetary defense


## ※Planetary defense team has been established in April 2024.

### Observations ★
- Bisei Spaceguard Center
- Stacking method

### Space Missions ★
- Hayabusa, Hayabusa2(#)
- DESTINY+, NGSR
- ESA's Hera, RAMSES

### Orbit analysis
- Orbit propagation
- Orbit estimation
- Collision analysis

### International activities
- SMPAG
- IAWN
- PDC
- IYAPD

### Domestic activities
- Symposiums/meetings
- Sessions related PD

### Outreach ★
- Asteroid Day
- APAON
- Public events

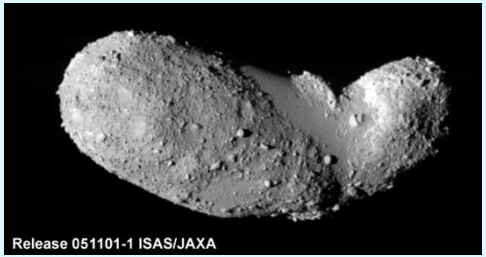
★ JAXA's responses to 2024 YR4

★ Today's talk

# NEO missions of JAXA

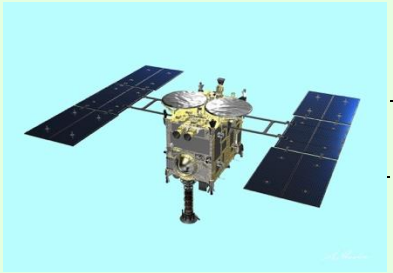
## Hayabusa
(2003-2010)

Rendezvous in 2005




**Itokawa**
**S-type, 530m**

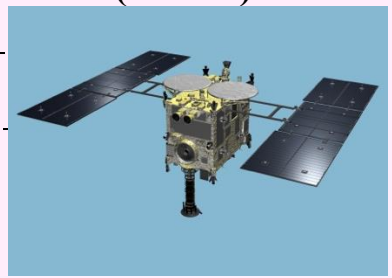
## Hayabusa2
(2014-2020)



Rendezvous in 2018


**Ryugu**
**C-type, 1000m**

## Hayabusa2#
(2020 ~ )



Flyby in 2026


Rendezvous in 2031


**Torifune**
**S-type, 450m ?**

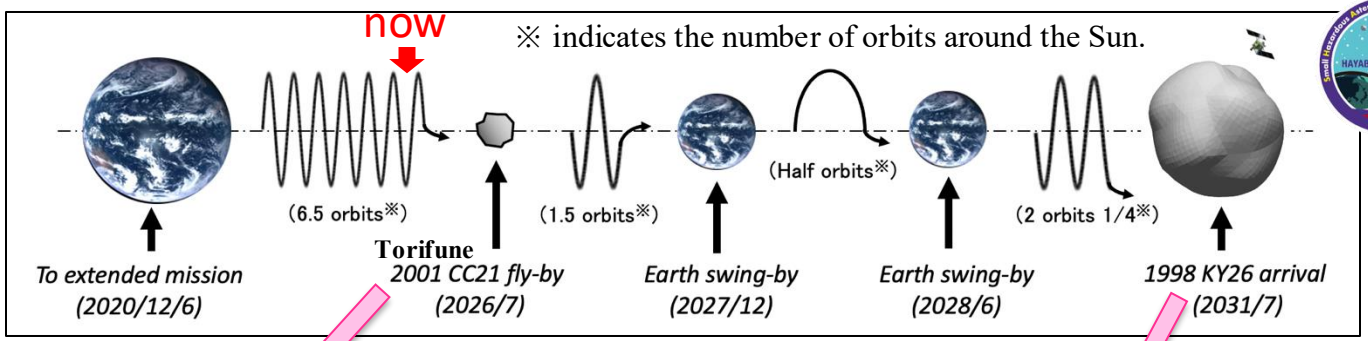
**1998 KY26**
**30m ? 11m?**


(Image credit : JAXA / A. Ikeshita)

# Hayabusa2 Extended mission : Hayabusa2#

**# (SHARP) : Small Hazardous Asteroid Reconnaissance Probe**

After Hayabusa2 returned the sample of Ryugu in Dec. 2020, we extended the mission for two more targets, (98943) Torifune (2001 CC21) and 1998 KY26.
The spacecraft is operated without major issues.



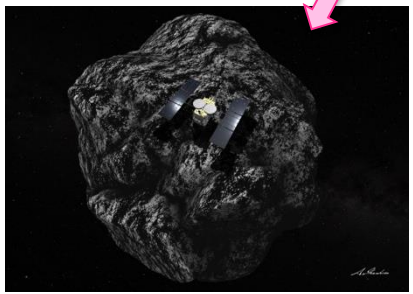

(©JAXA)

**Relative velocity : 5km/s**

**Distance: < 10km, 1km?**

**High accuracy navigation is necessary.**

Artist's illustration (by A. Ikeshita)



**Asteroid size : ~30m or 11m? (spin period : ~11 or 5min?)**

**The collision probability of such asteroids with the Earth is once in 100~200 years.**

# NEO missions of JAXA & collaboration with ESA

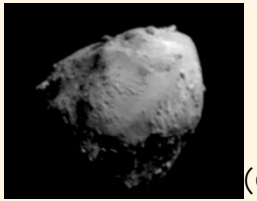
## Hera (ESA)

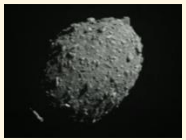
(2024 ~ )


**JAXA provided TIRI.**

(TIRI : Thermal Infrared Imager)

Rendezvous in 2026





(©NASA)

**Didymos** S-type, 850m

**Dimorphos** S-type, 170m

## RAMSES (ESA)

(2028 ~ )


**JAXA will provide TIRI and solar array wings.**

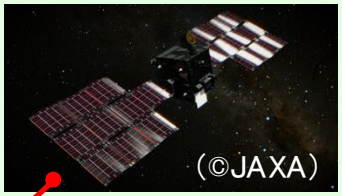
Rendezvous in 2028


**Apophis**

Sq-type, 340m

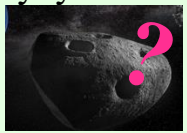
## DESTINY+

(2028 ~ )




**Dual launch by H3 rocket**

flyby in 2028




(©ESA)

**Apophis**

flyby in 2030


(©JAXA)

**Phaethon**

F-type, 6km

## NGSR

**Next Generation small body Sample Return mission**

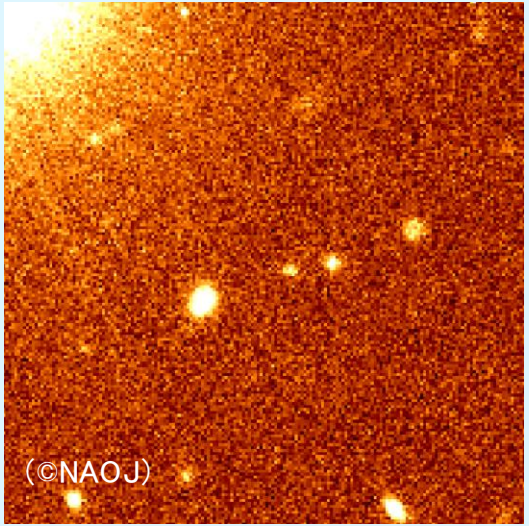
**(2030s )**

**Target : comets**
**Ex.**
**289P/Blanpain**

# JAXA's responses to 2024 YR4

## Observations

JAXA requested the Subaru Telescope of NAOJ to observe 2024 YR4.




Images of 2024 YR4 taken by Subaru Telescope on Feb. 20, 2025.

## Orbit calculations

- JAXA has software called Deep-space multi-object orbit determination system (DMOODS) for the orbit determination of deep space mission.
- We have added a function to directly import asteroid observation data of ground-based telescopes.

**We calculated the collision probability of 2024 YR4 with the Earth. The results were consistent with those by JPL and ESA.**

## Mission analysis

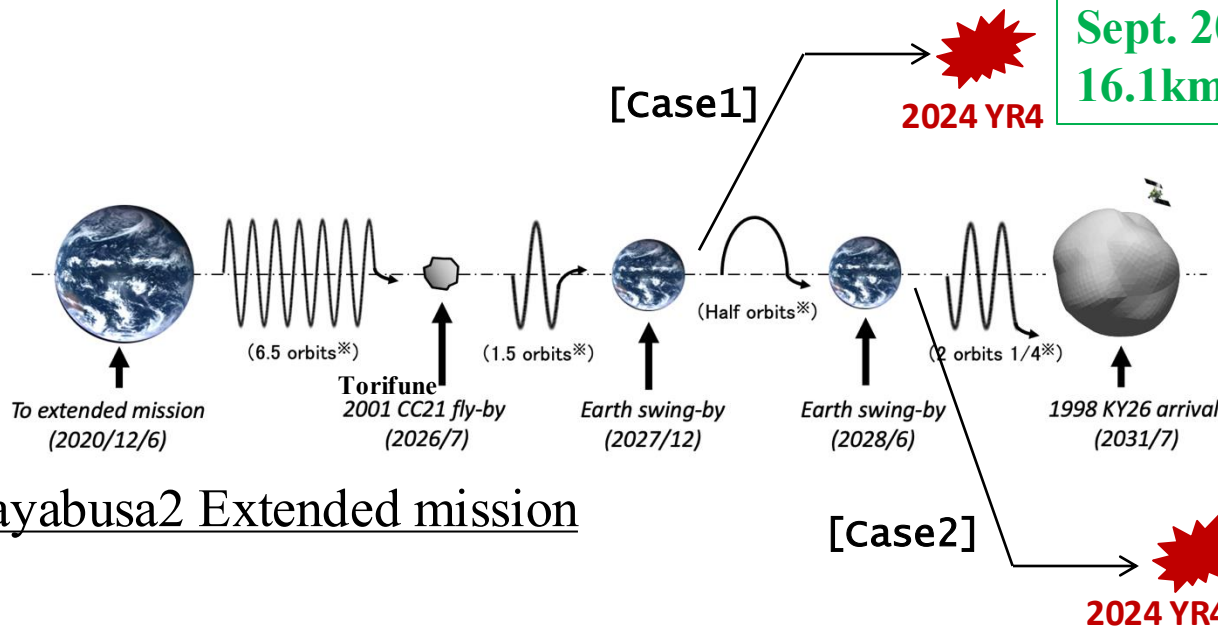
- At present, JAXA is operating Hayabusa2 spacecraft.
- The mission team analyzed the possibility to send Hayabusa2 spacecraft to 2024 YR4.

**Hayabusa2 can reach 2024 YR4 in 2028.**

# Analysis of deflection of 2024 YR4 by Hayabusa2

**Would it be possible to change the orbit of 2024 YR4 using Hayabusa2, which is currently in flight?**

⇨ **Yes (?)**




Hayabusa2 Extended mission

# Observation for 2025 FA22

**2025 FA22**

- March 29, 2025 : Discovered by Pan-STARRS 2
- Sept. 18, 2025 : Approached the Earth as close as 840,000 km
- Size : 130 ~ 290 m

**JAXA's actions for this asteroid**

➢ **Radar observation**

•JAXA participated in Australia's SHARP (Southern Hemisphere Asteroid Radar Program), and was able to receive radar signals transmitted from Canberra and reflected by the asteroid at Usuda Deep Space Center in Japan.

➢ **Light curve observation**

•JAXA asked APAON* members and Japanese amateurs to observe the light curve and five observes got the light curve data. *Asia-Pacific Asteroid Observation Network

➢ **Outreach**

•JAXA worked with volunteers to organize an observation campaign for public people to try observing this asteroid.

Data analysis