JAXA's Activities for Planetary Defense

Feb. 6, 2025@Vienna, Austria

JAXA Planetary Defense Team

New logo (almost final version)

JAXA's activities for planetary defense

※Planetary defense team has been established in April 2024.

Observations

- NEO observation at Bisei Spaceguard Center (BSGC)
- Discovery of high-speed moving objects by new NEO search method

Space Missions

- Past & current : Hayabusa, Hayabusa2, Hayabusa2 extended mission
- Future : DESTINY^{+}, Next Generation Sample Return mission
- Participation in ESA's Hera mission
- RAMSES collaboration: technical feasibility study

International activities

- SMPAG, IAWN, PDC, Asteroid Day

Domestic activities

- Symposiums/meetings/sessions related PD

Outreach

- Asteroid observation for citizen science (ex. asteroid occultation obs.)

RAMSES collaboration

JAXA is considering to provide the following to RAMSES:

- **Thermal Infrared Imager**

  → Almost ready (A flight spare of the Hera TIRI)

- **Lightweight Solar Array Wings**

  → Production will begin in this year

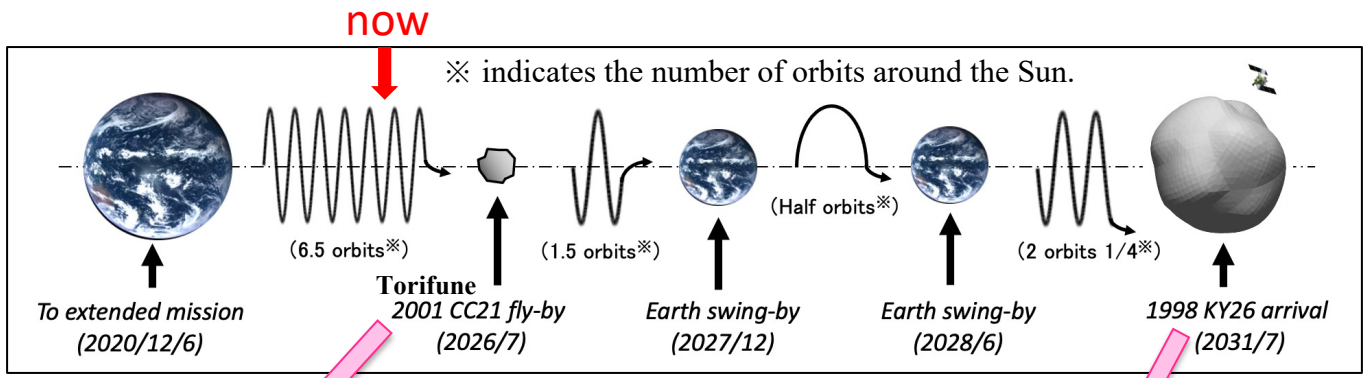
- **Launch opportunities**

  → Considering technical issues. The conclusion is expected to be known by the end of March.

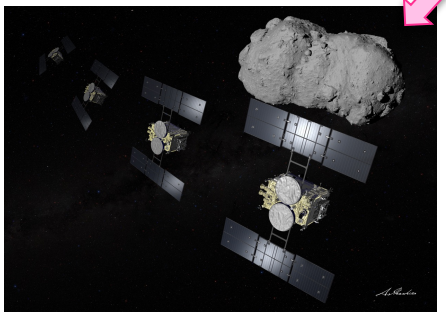
Hayabusa2 Extended mission : Hayabusa2#

 # (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.



(Image credit：JAXA)



Artist's illustration (by A. Ikeshita)

Relative velocity : 5km/s

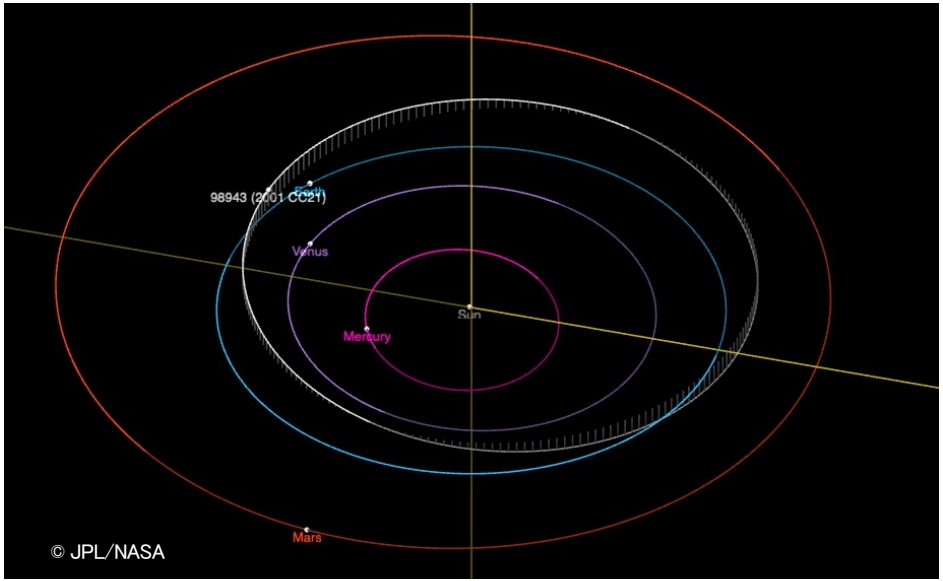
High accuracy navigation is necessary.

Asteroid size : ~30m (spin period : ~11 min)

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

Target : (98943) Torifune (2001 CC21)

- a = 1.032 au, e = 0.219, i = 4.81 degs, orbital period: 383 days
- Absolute Magnitude: 18.5, Rotation Period: 5.02 hours, Diameter: 310~700 m
- Shape: Elongated Shape (b/a ~ 0.5-0.83)
- Asteroid Type: S or Sq (from recent observations)



Itokawa

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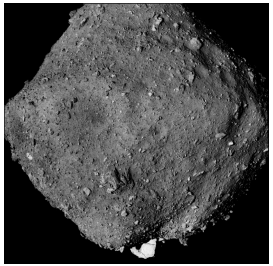
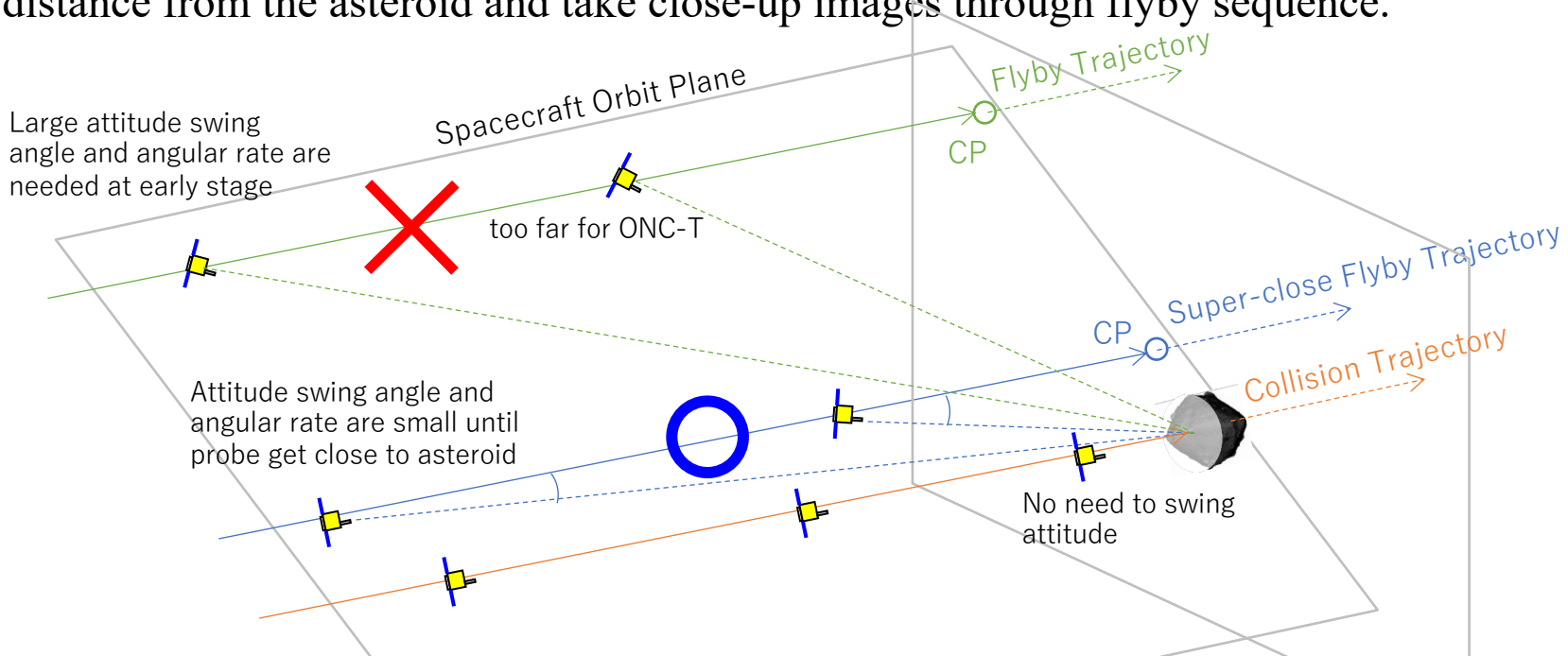


Ryugu

Super-close Flyby Concept

- Spacecraft will approach to asteroid with velocity about 5 km/s
- The Tele-Optical Navigation Camera (ONC-T) for rendezvous mission is not so high resolution for the flyby observation
- Hayabusa2 is planned to approach to the very proximity of asteroid like less than 100 km distance from the asteroid and take close-up images through flyby sequence.



Symposiums, meetings, sessions in Japan in the near future

- PERC International symposium on Dust & Parent bodies (IDP2025)
  https://www.perc.it-chiba.ac.jp/meetings/IDP2025/Welcome.html (by Chiba Institute of Technology)
  +
  FY2024 Planetary Defense Symposium (by JAXA)
  https://www.isas.jaxa.jp/en/researchers/info/003914.html
  Feb. 25–27, 27-28, 2025@Chiba Institute of Technology Tokyo Skytree Town®Campus & online
  IDP2025 PD symp..
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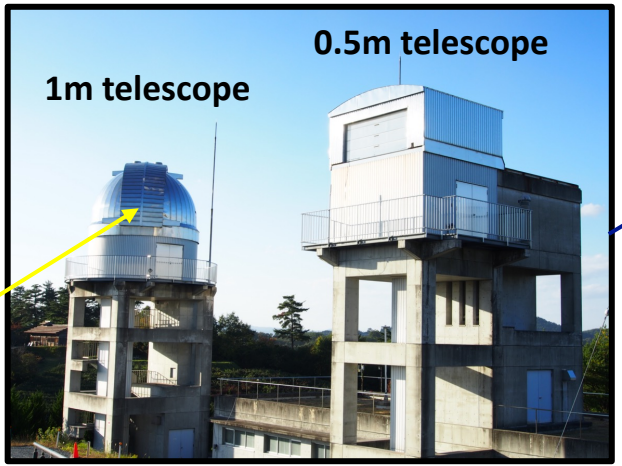
- Hera, Apophis T-4, and RAMSES in Tokyo 2025
  https://www.hera-apophis-ramses-tokyo.org/en-us/
  https://www.hou.usra.edu/meetings/apophis2025/
  April 7-11, 2025@Univ. of Tokyo & online

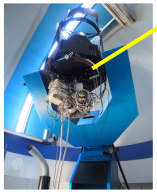
- JpGU2025 (May 25-30, 2025) (JpGU : Japan Geoscience Union)
  https://www.jpgu.org/meeting_e2025/
  Planetary defense session : PM of May 29, 2025 (tentative) @Chiba, Japan & online
  https://www.jpgu.org/meeting_e2025/sessionlist_en/detail/M-ZZ40.html

References

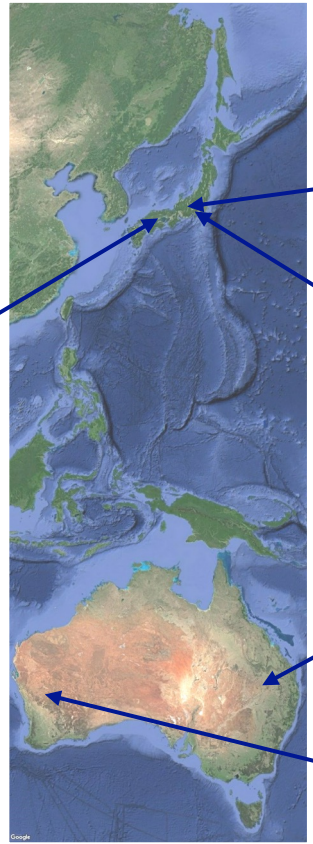
Asteroid observations in JAXA

Bisei Spacegurad Center (BSGC)
(Space Tracking and Communications Center)



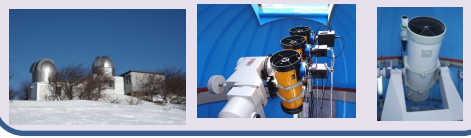


- Built in 2000 and owned by the Japan Space Forum, it was transferred to JAXA in April 2017.
- The observation work is carried out by the Japan Spaceguard Association (NPO).
- Observation targets: Space debris, NEO (asteroids)



Observation facility of Research and Development Directorate

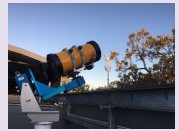
Mt.Nyukasa Observational facility



Chofu LEO Observational facility

Remote observation site at Siding Spring Observatory

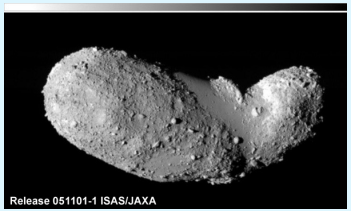
Remote observation site at Zadko Observatory



NEO missions of JAXA

Hayabusa (2003-2010)

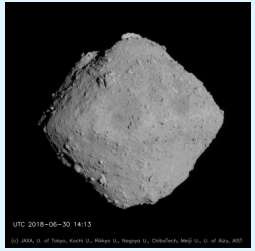
arrived in 2005



Itokawa
S-type, 530m

Hayabusa2 (2014-2020)

arrived in 2018



Ryugu
C-type, 1000m

Hayabusa2# (2020 ~)

flyby in 2026

Torifune
S-type, 500m ?

Rendezvous in 2031

1998 KY26
30m ?

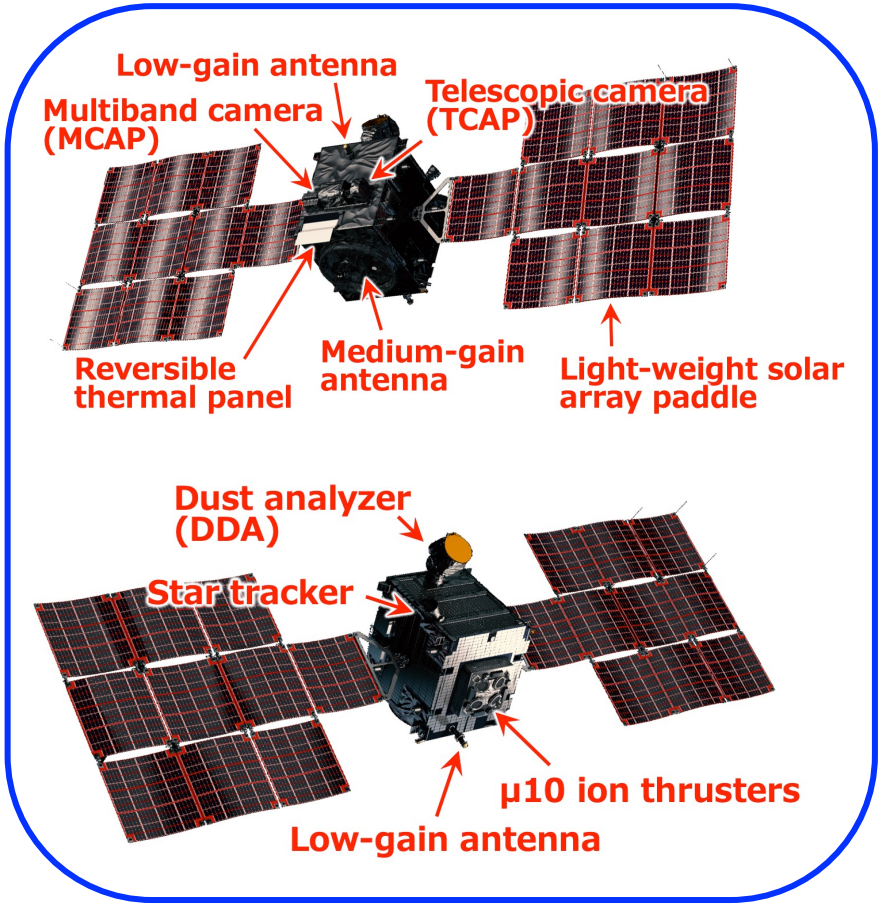
Hera (ESA)
JAXA provided TIRI.
Target : Didymos, Dimorphos
Launch 2024, arrival 2026

DESTINY+
Target : Phaethon
Launch 2028, flyby 2030

Next Generation small body Sample Return mission
Target : comets
Launch 2030'

(Image credit : JAXA / A. Ikeshita)

DESTINY+



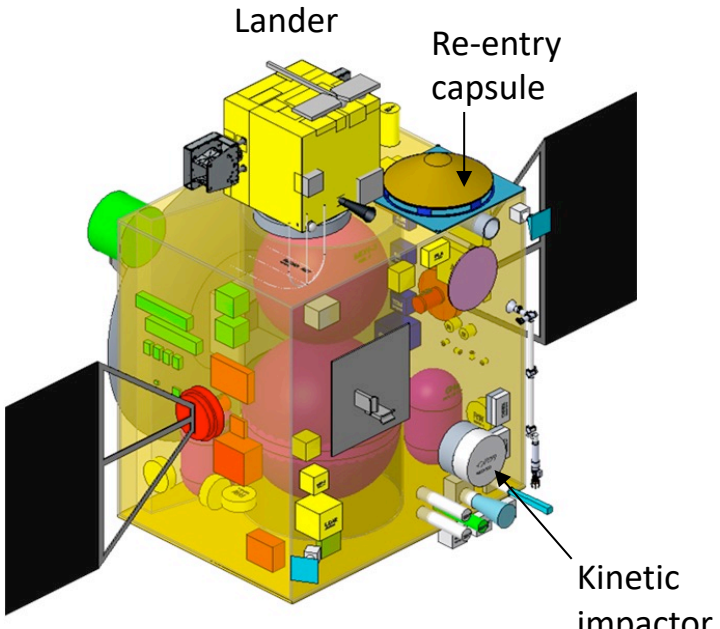
- **Phaethon** flyby mission (Parent body of Geminid)
- Technology demonstration and science observation
- Very high-speed flyby : 36km/s
- Closest distance : 500±50 km
- Science : dust measurement
- Launch : in fiscal year of 2028 by H3 Launch Vehicle
- Phaethon flyby : in 2030

(Information : by H. Imamura)

NGSR

Next Generation small body Sample Return mission

Concept Study



Cruising configuration

- Target : short-period comets
  289P/Blanpain (nominal), 252P, 15P
- Schedule : Lauch 2034, Arrival 2040, Earth return 2046
- Spacecraft : multi-craft system
  - Deep Space Orbital Transfer Vehicle (DSOTV) for the round-trip deep-space travel
  - Lander for sample collection
  - Small probes (Kinetic impactor, Mini LND, …)

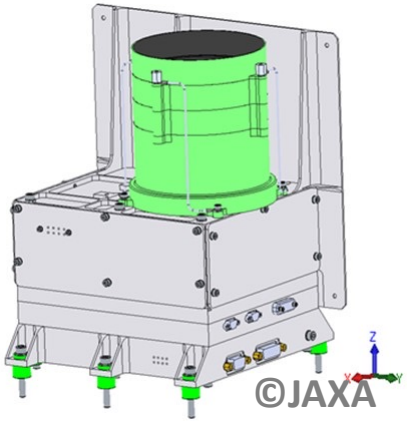
Contribution to Hera

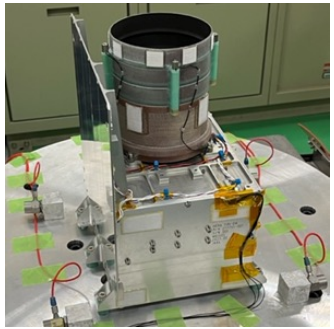
ESA Hera

©ESA

Launch : Oct. 7th, 2024, 14:52 (UTC)
Arrival at Didymos – Dimorphos : Dec. 2026

- JAXA provided a thermal infrared imager (TIRI) to Hera.





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