Asteroid explorer Hayabusa2
Press Conference

December 4, 2020

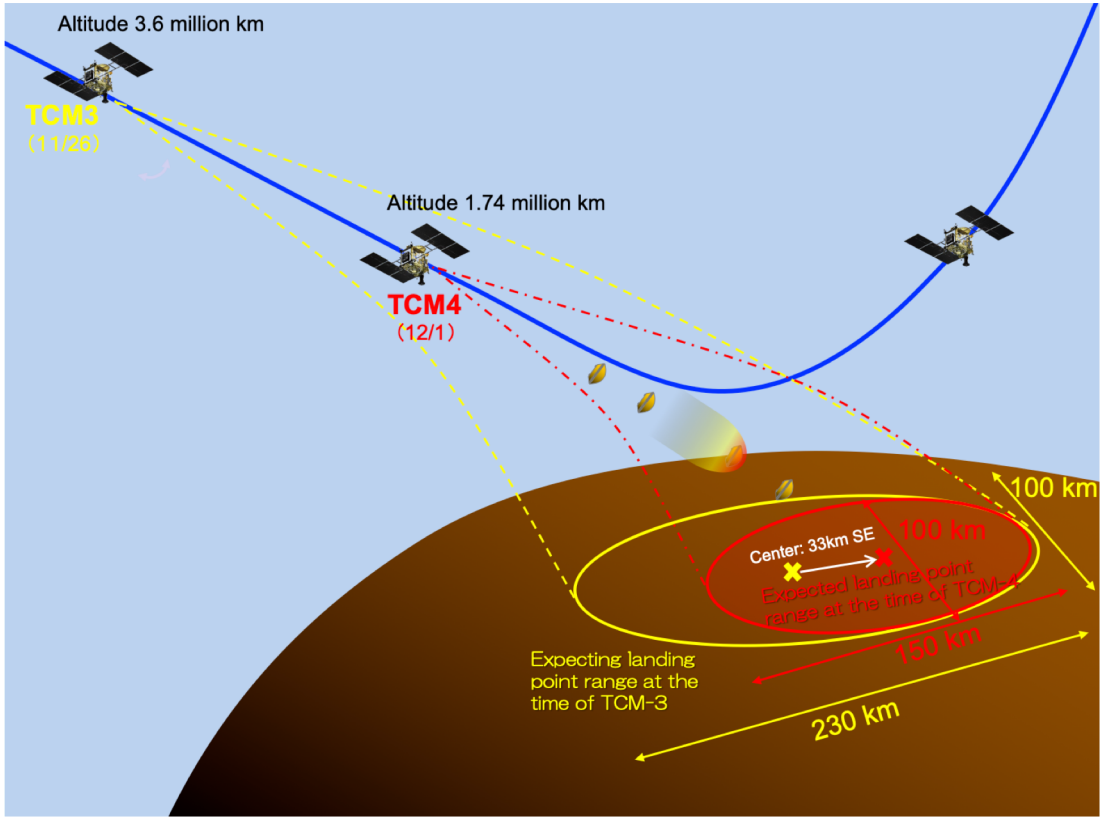
JAXA Hayabusa2 Project

Hayabusa2 capsule separation operation

The spacecraft, spacecraft operation, re-entry capsule recovery preparation work and ground systems are not experiencing any problems. The re-entry capsule will be separated and operated as planned.

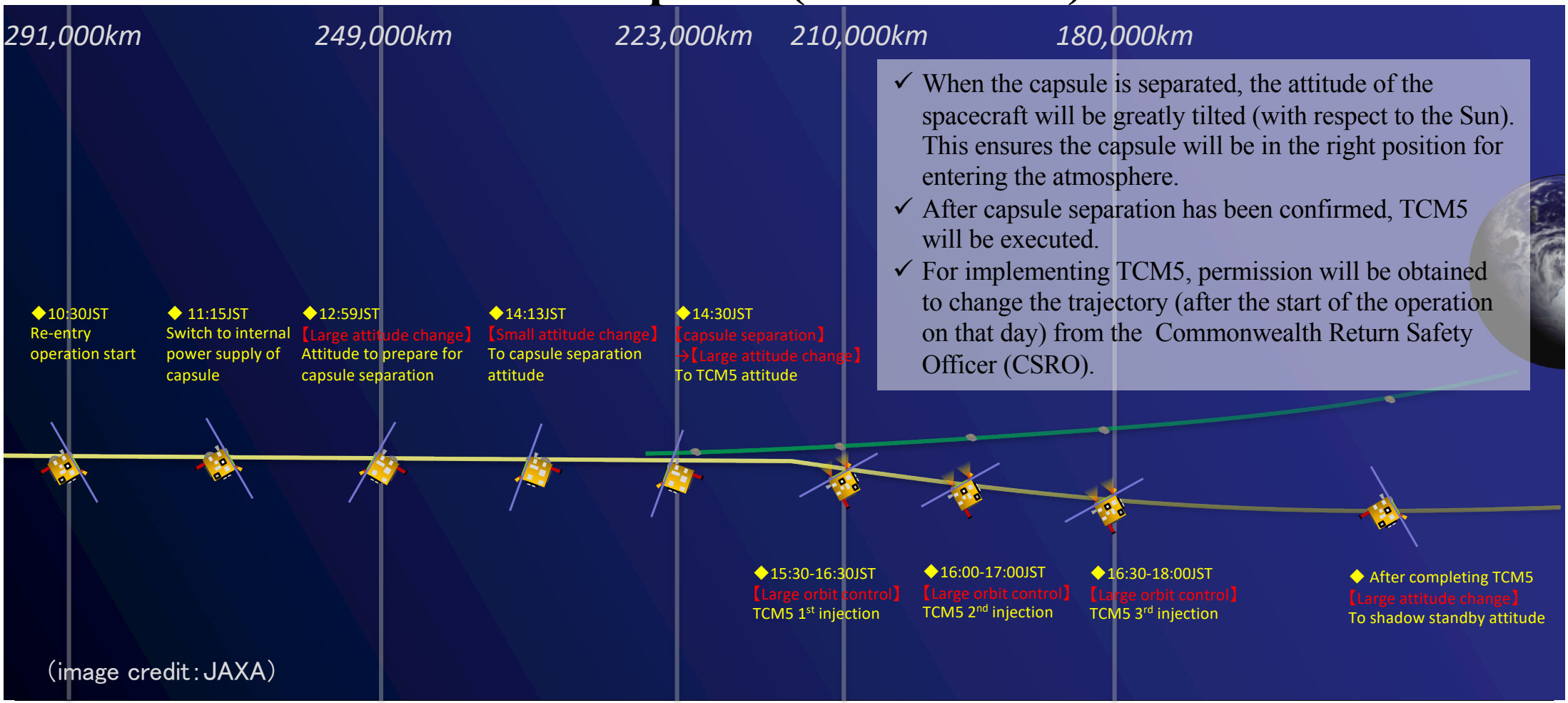
Status of spacecraft re-entry

- On December 1, orbit control with TCM-4 was performed and the spacecraft is on the planned trajectory.
- The orbit control amount in TCM-4 is about 4.6 cm/s.
- TCM-4 adjusted the planned landing area for the capsule by 33km to the south-east.
- Subsequent orbit estimation confirmed the spacecraft is on the planned trajectory.

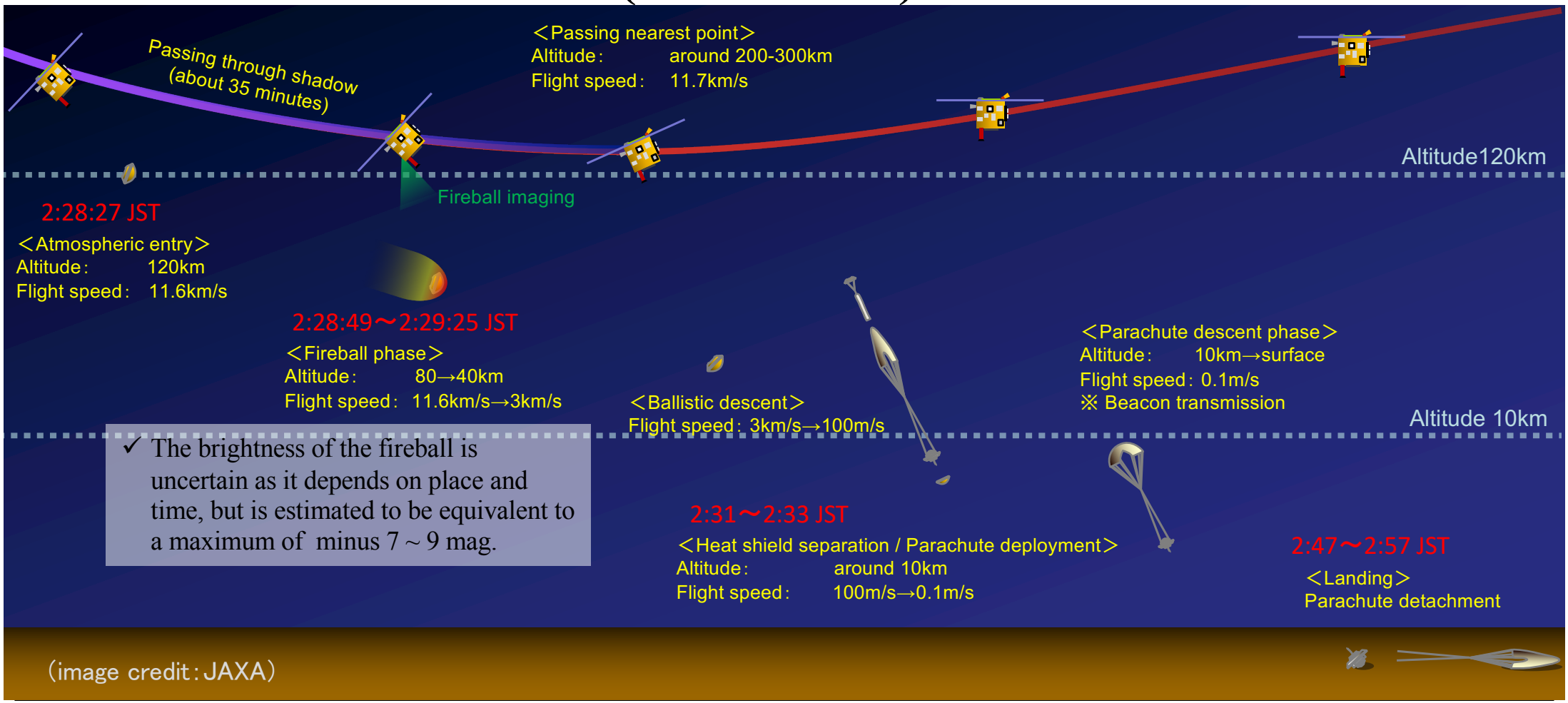


(image credit：JAXA)

Sequence for capsule separation / departure from Earth's sphere (December 5)



Movement of spacecraft / capsule during re-entry (December 6)



（image credit：JAXA）

Capsule separation & re-entry schedule

Schedule

Event	Time (JST)	Earth distance (altitude)
TCM-4 (orbit correction)	Dec 1 around 16:00	1,740,000 km
Capsule separation	Dec 5 14:30	220,000 km
TCM-5 (orbit control to depart from the Earth's sphere)	Dec 5 15:30 ~ 18:00	200,000 ~ 160,000 km (spacecraft)
Spacecraft enters shadowed area	Dec 6 1:57	12,000km (spacecraft)
Capsule imaging	Dec 6 2:28 ~ 2:30	700km ~ 300km (spacecraft)
Spacecraft exits shadow	Dec 6 2:31	350km (spacecraft)
Capsule atmospheric entry	Dec 6 2:28:27	120km (capsule)
Capsule : fireball phase	Dec 6 2:28:49 ~ 2:29:25	80 km ~ 40 km (capsule)
Parachute deployment	Dec 6 2:31 ~ 2:33	11~7km (capsule)
Capsule landing	Dec 6 2:47 ~ 2:57	0km (capsule)

※The time of the fireball phase can have an error of several seconds due to orbit error, weather, etc.

Preparation for capsule collection

From Dec 1 to Dec 2, a recovery rehearsal was held in Woomera in real time.

＜Rehearsal flow＞

- Standby for headquarters, antenna stations, observation stations
- Measurements at each antenna station
- Estimation of landing point from measurement results
- Fly helicopter towards the landing point.
- Collected simulation capsule
- Transport capsule to QLF

＜Rehearsal results＞

- Overall flow of collection operation was confirmed.
- Minor corrections have been identified and will be reflected in the actual procedure.
  （e.g. communication of latitude and longitude of the landing point, etc.）

Preparation for capsule collection

Optical observations (GOS)

Transporting the collected sample from the helicopter to QLF (Quick Look Facility)

（image credit：JAXA）

Preparation for capsule collection

“Sagamin” is also in the field

（image credit: JAXA）

Observation operation after the Earth swing-by

After capsule separation, observations and experiments will be conducted using the spacecraft's onboard equipment.

The main observations and experiments are:

■Observations with the Optical Navigation Camera (ONC)

- Earth imaging（12/6 ~06:30JST）and "Goodbye Earth" observation（12/6~）
- Moon imaging（12/6~）
- Purpose：Calibration and public relations

■Observations with the Thermal Infrared Imager (TIR)

- Observations of the Earth & Moon（12/6~）
- Purpose： Calibration. Investigate the characteristics of the instrument and use this in Ryugu data analysis.

Observation operation after the Earth swing-by

（Continued）

■LIDAR optical link experiment

- Experiment: After the return of Hayabusa2 to Earth, attempts will be made to send a laser beam from the ground station and receive it at Hayabusa2, and then to send a laser beam from Hayabusa2 towards the ground and receive it at the ground station.
- Significance：Aid in the development of laser range technology in space exploration.
- Cooperation：National Institute of Information and Communications Technology（NICT）, Australian, French, German observatories

  （Ground station）：National Institute of Information and Communications Technology Koganei Station (Japan), Mount Stromlo Observatory (Australia), L'Observatoire de Grasse (France), Geodetic Observatory Wettzell (Germany).
- Schedule：Begin immediately after returning to Earth. Scheduled period is December 7 ~ 23. This may be cancelled depending on weather.

Schedule

■Press conference

2020/12/6　16:30～　　JAXA Sagamihara campus

■Online relay

2020/12/5　13:30～16:40 (possible extension until 17:30)　Capsule separation

2020/12/6　02:00～03:10　　Capsule fireball

Reference

Observation of the re-entry fireball phase

App that displays the predicted trajectory of the re-entry capsule in AR (Augmented Reality):
「Reentry AR」(from Toriningen)

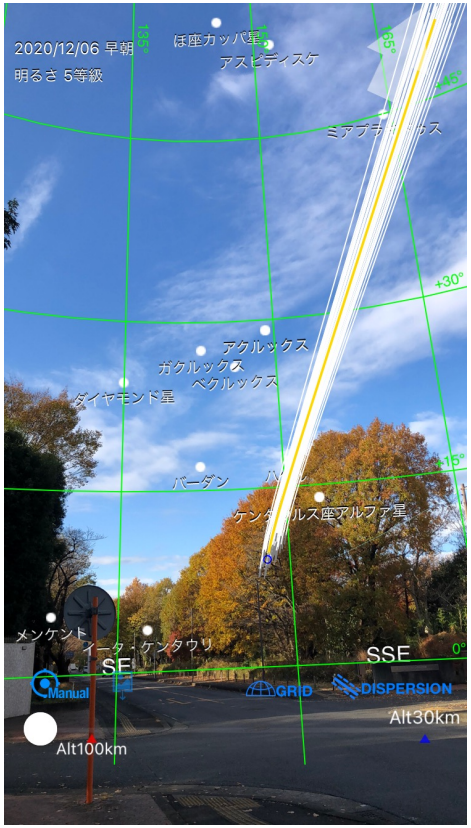
・When you select the observation site, the predicted track of the fireball is displayed in AR.

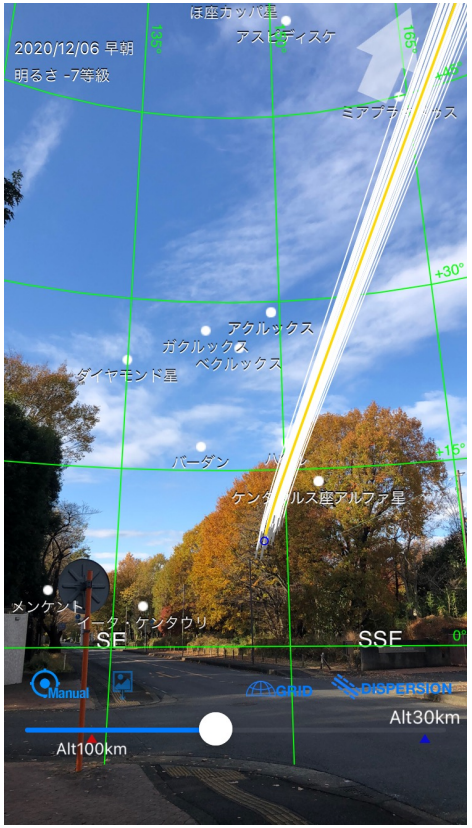
・The expected brightness according to altitude is also displayed.

App download（iOS only）

Japanese

English

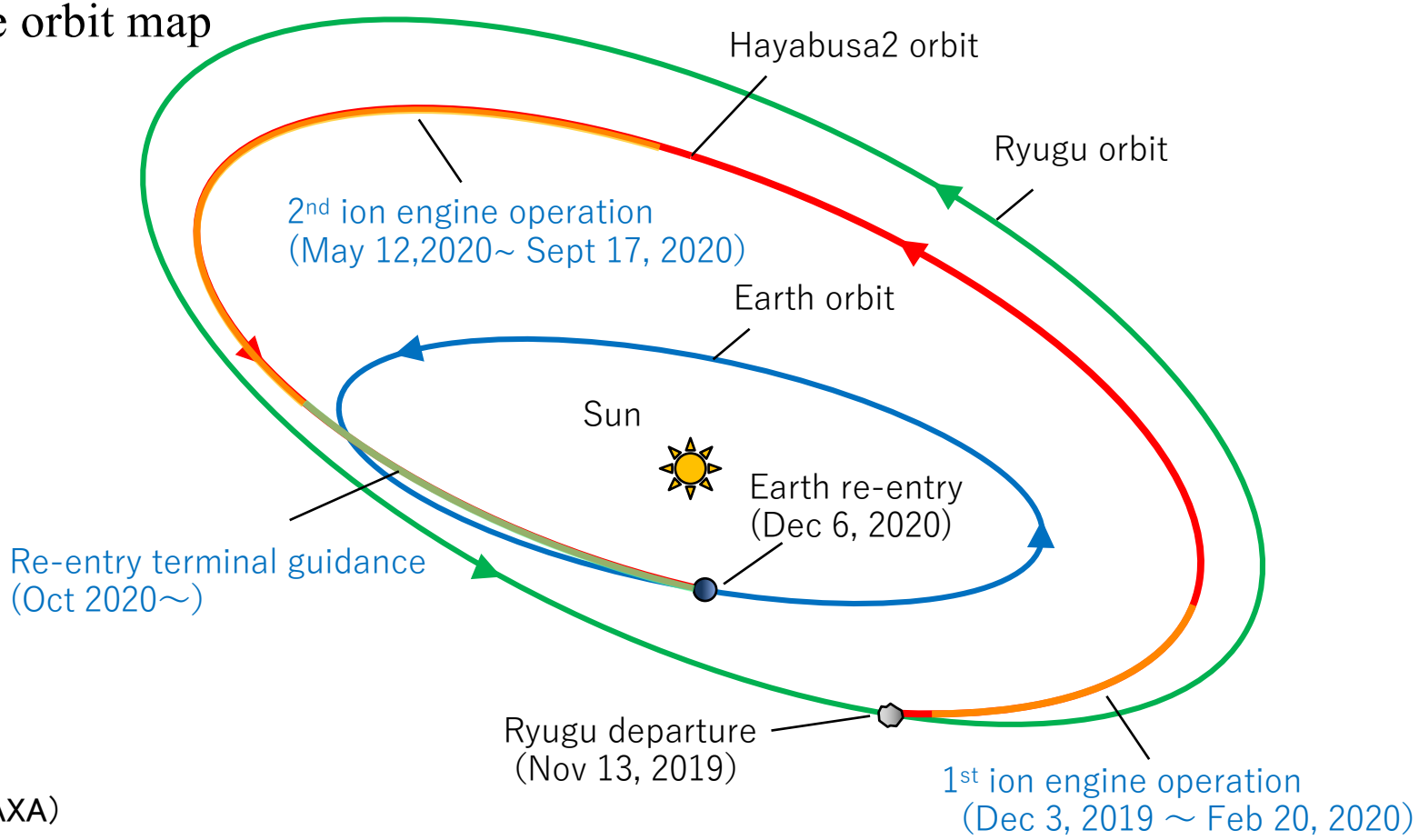




Trajectory when the observation site is Coober Pedy.
The background here is in front of the JAXA Sagamihara campus

Return cruise operation plan

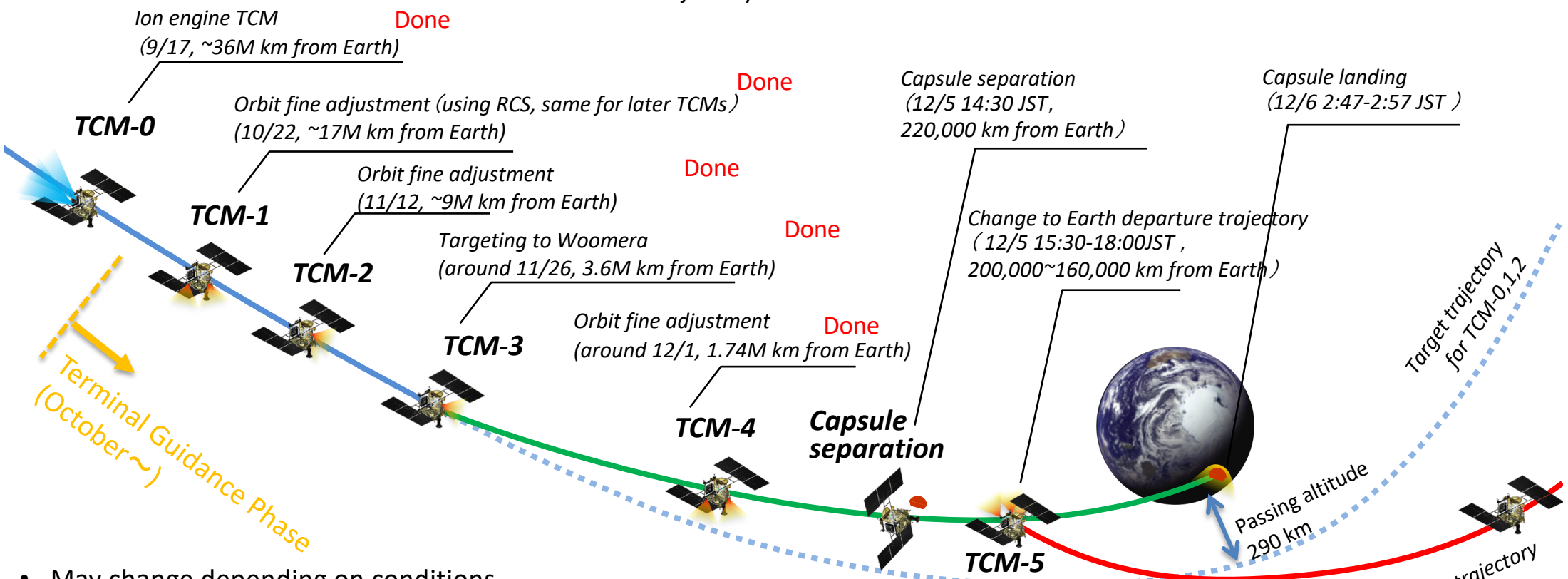
Return phase orbit map



(image credit：JAXA)

Operation plan for re-entry terminal guidance

※TCM: Trajectory Correction Maneuver



- May change depending on conditions.
- At TCM-0,1,2, the spacecraft will enter an orbit that passes more than 200 km away from the Earth.
- After capsule separation, the spacecraft will divert from the reentry trajectory by TCM-5.

(Image credit：JAXA)