

Arrival at Ryugu, to find its unfriendly surface



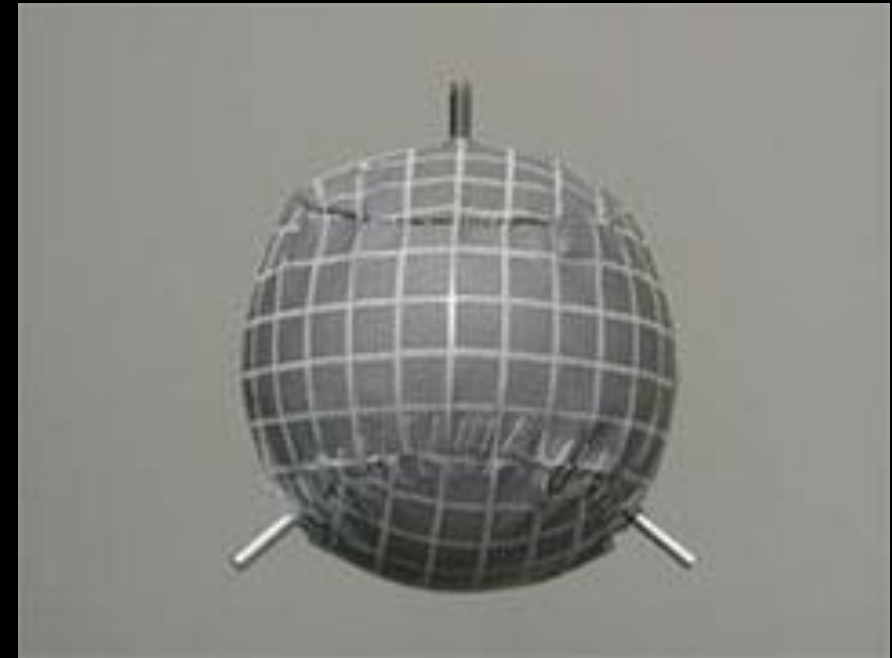
UTC 2018-06-15

The original plan:

- First Touch-Down (TD1) and sampling at the end of Oct 2018
- Three TDs in total
- Pin-point landing utilizing a **Target Marker (TM)** to be performed at the TD3

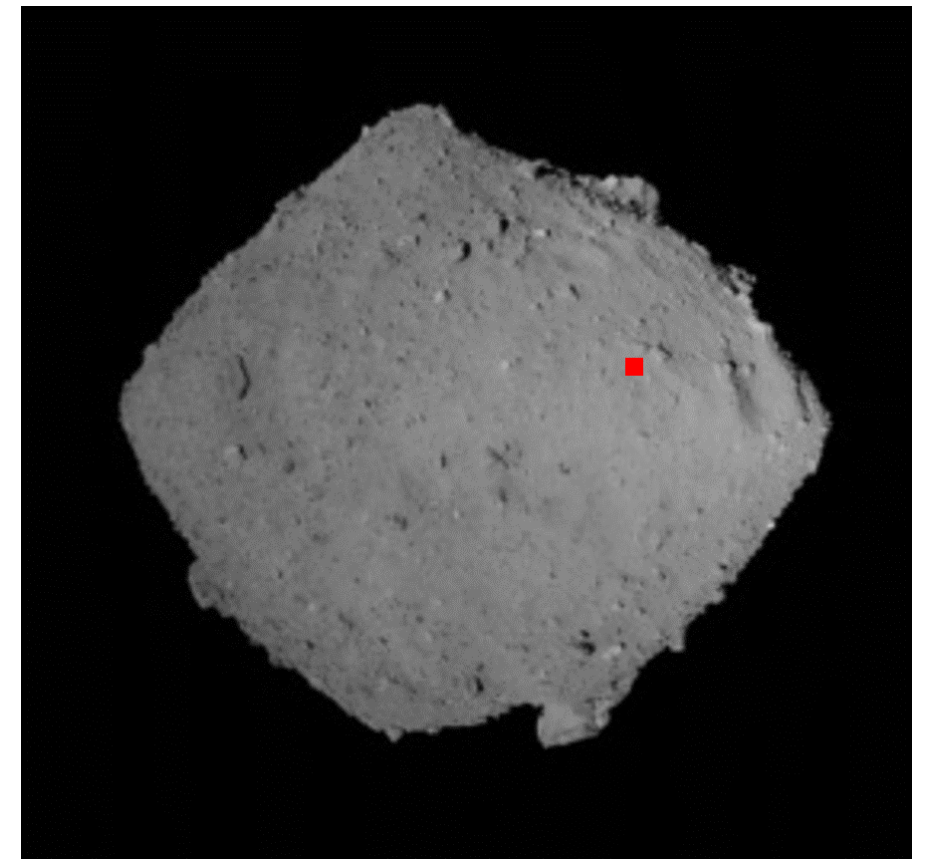
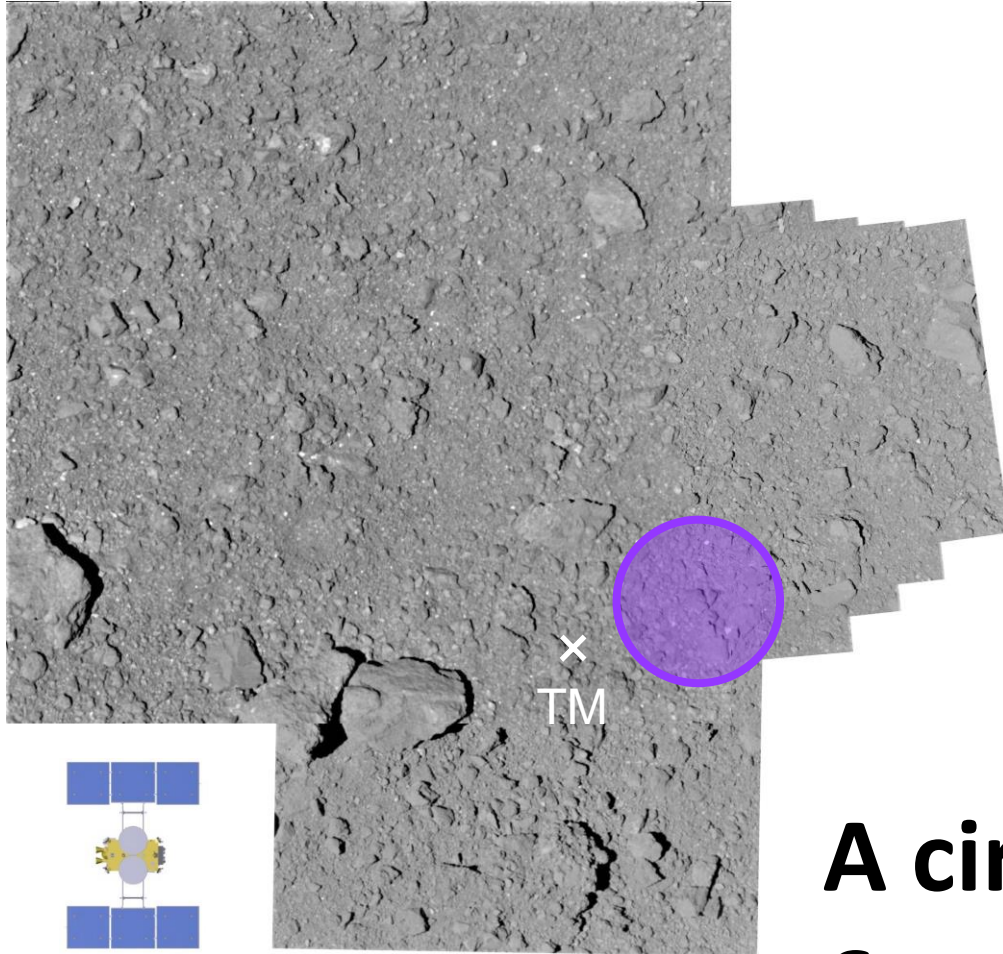
The team naturally changed the plan to

- Postpone TD1 to early 2019
- **Introduce pin-point landing technique for TD1**



A pleasant surprise was that none of the media folks complained the delay of TD1.

TM as the lighthouse leading
the spacecraft to hit a hole-in-one

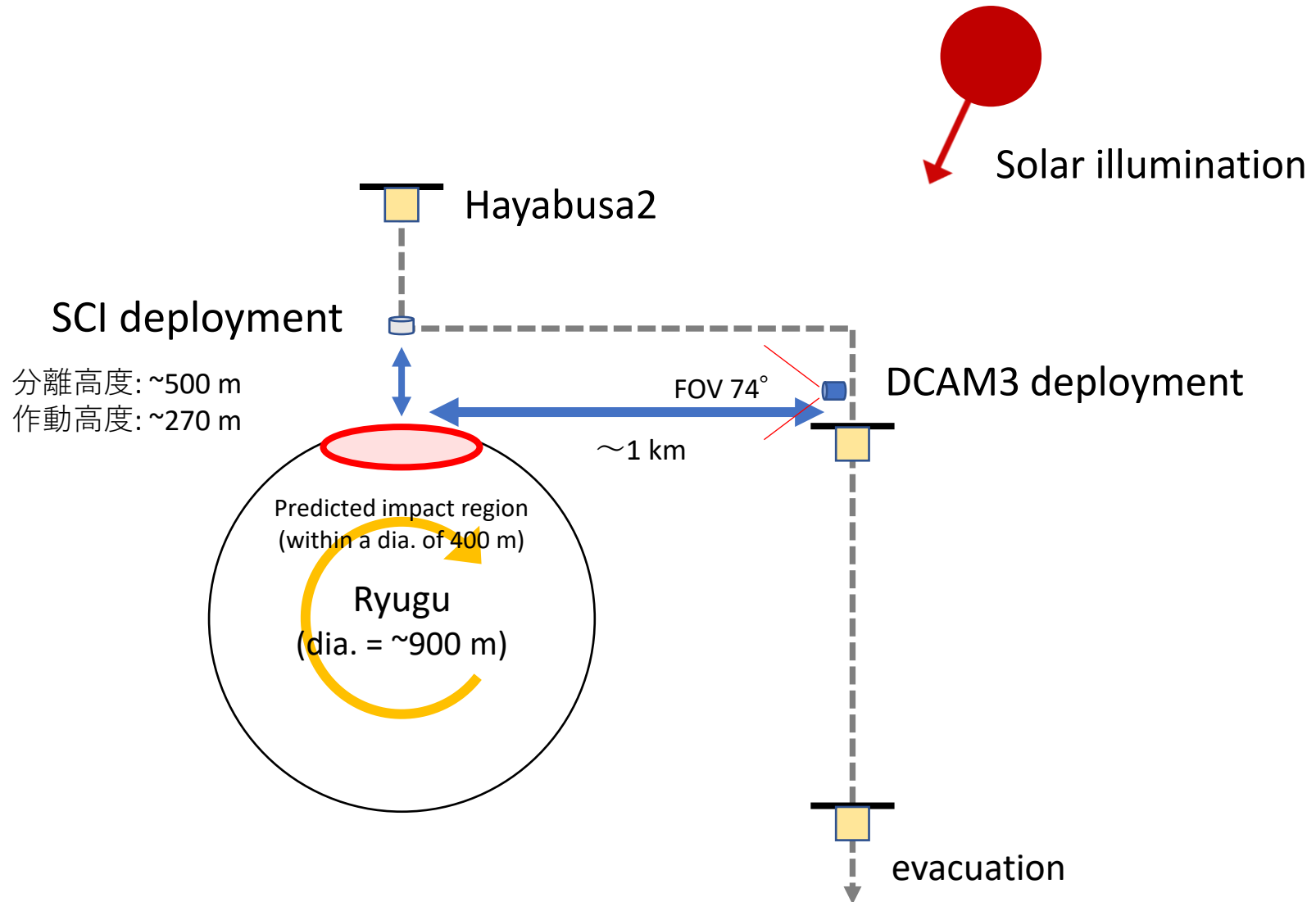


**A circle of
6m diameter**

February 22, 2019 0748JST



Impact experiment configuration



-3 s



Impact experiment

Formation of artificial crater

- To study the crater formation mechanism under micro-gravity
- To excavate unweathered surface material for sampling from the surface → Go for **TD2**

Should we go for it?

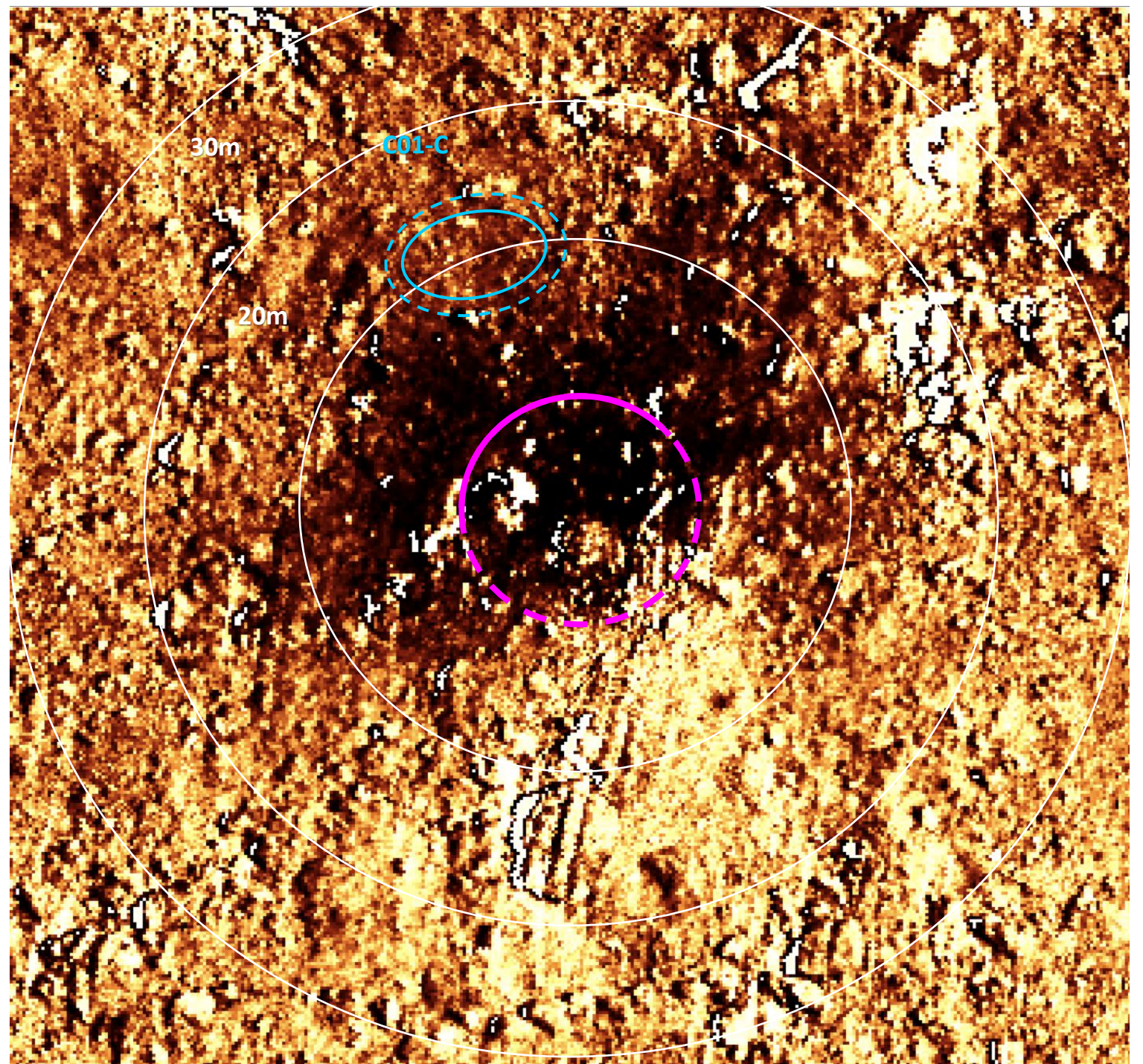
... we got samples already, why take the risk?



The new target C01-c

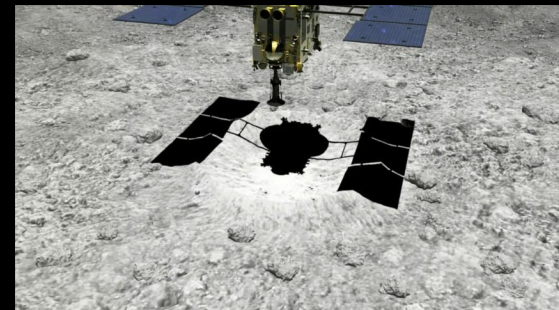
At 20m from the center of
the crater

Covered by darker
materials: Covered by
materials ejected from
subsurface by the impact
experiment

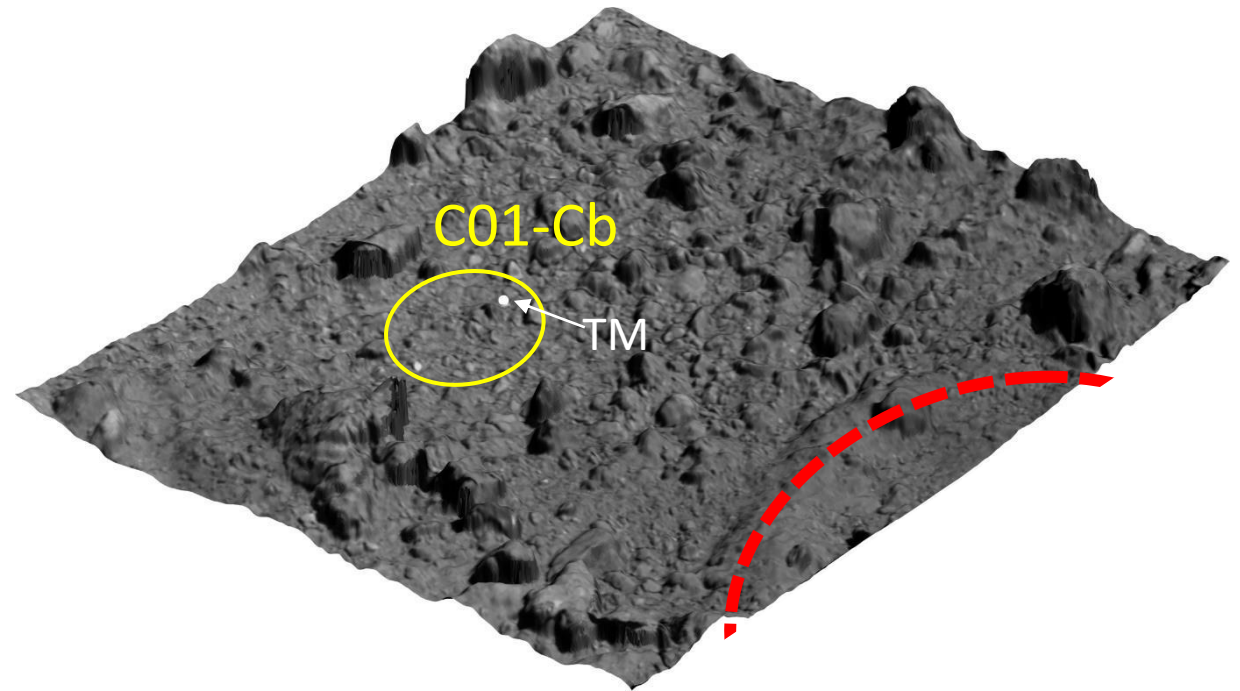
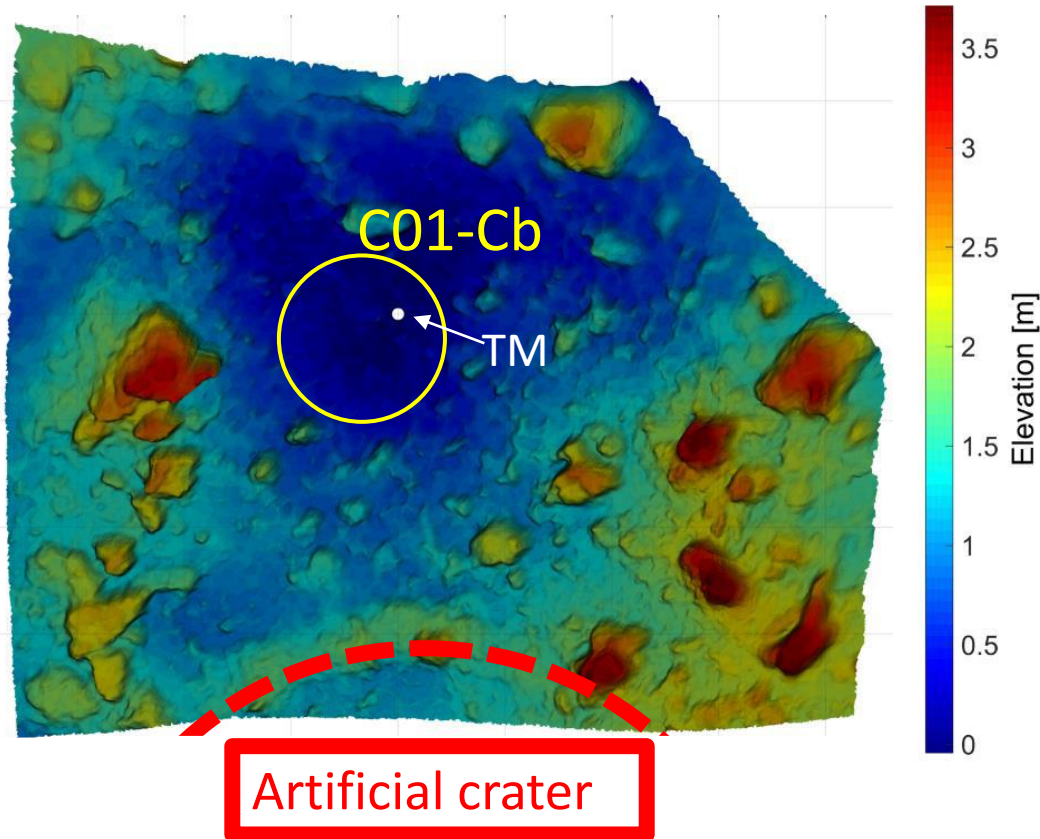


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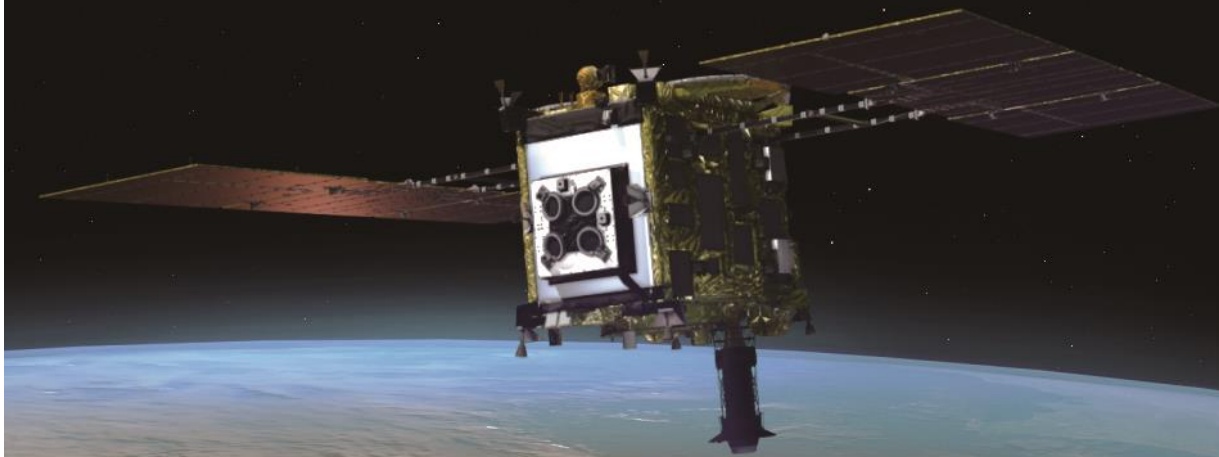
This 7m-diameter circle, with the TM sitting inside of it, is the target for TD2.



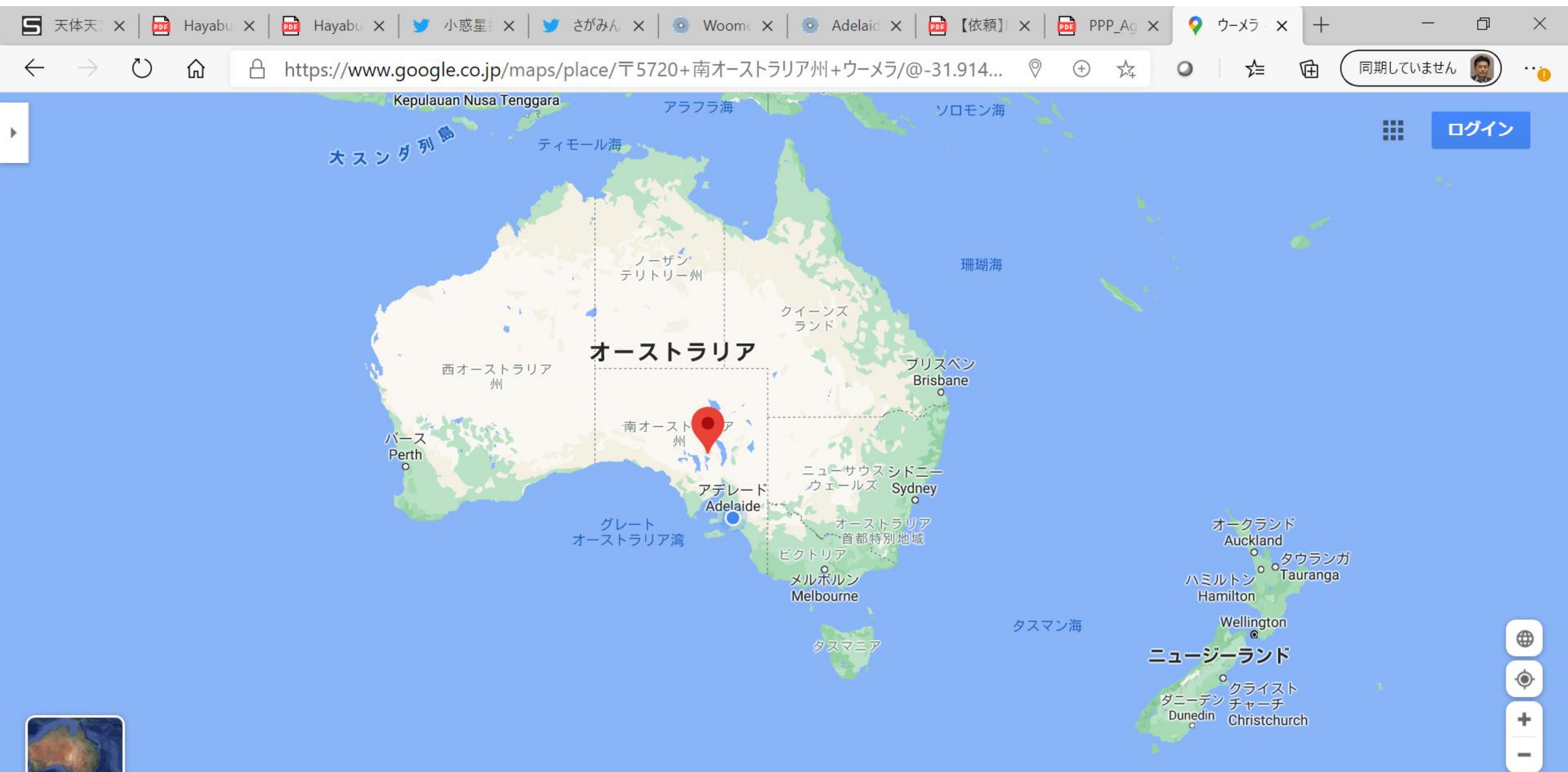
July 11, 2019 10 : 06 JST
TD2 completed perfectly



Returning
the samples
back to earth

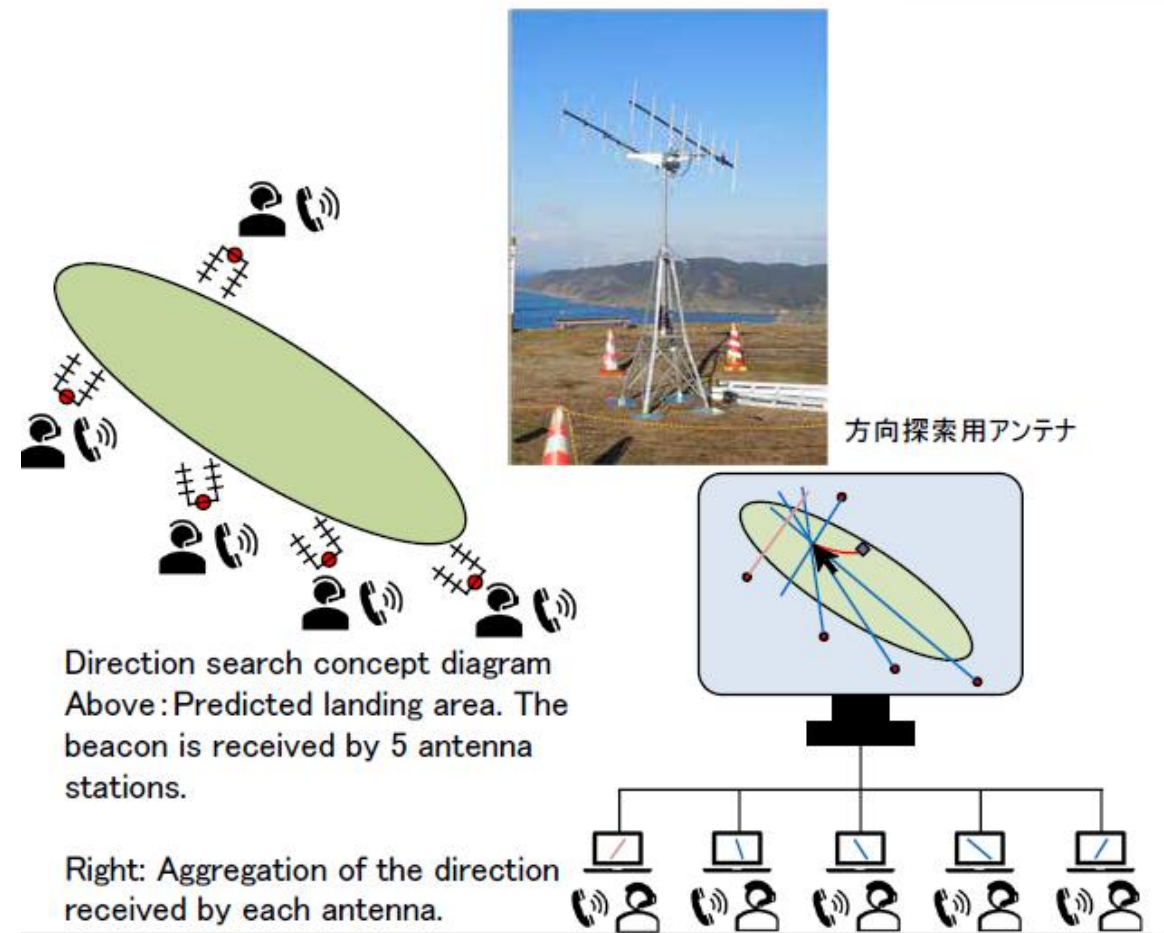
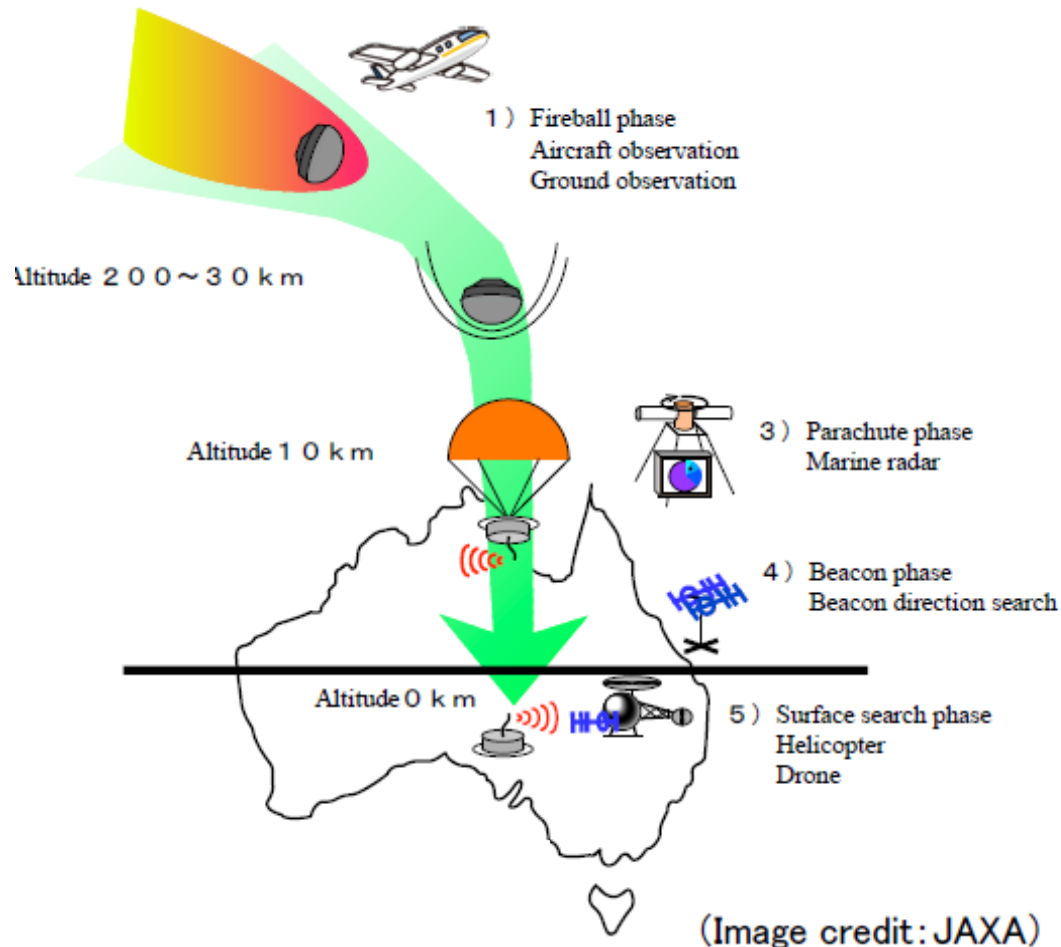


Woomera, Australia



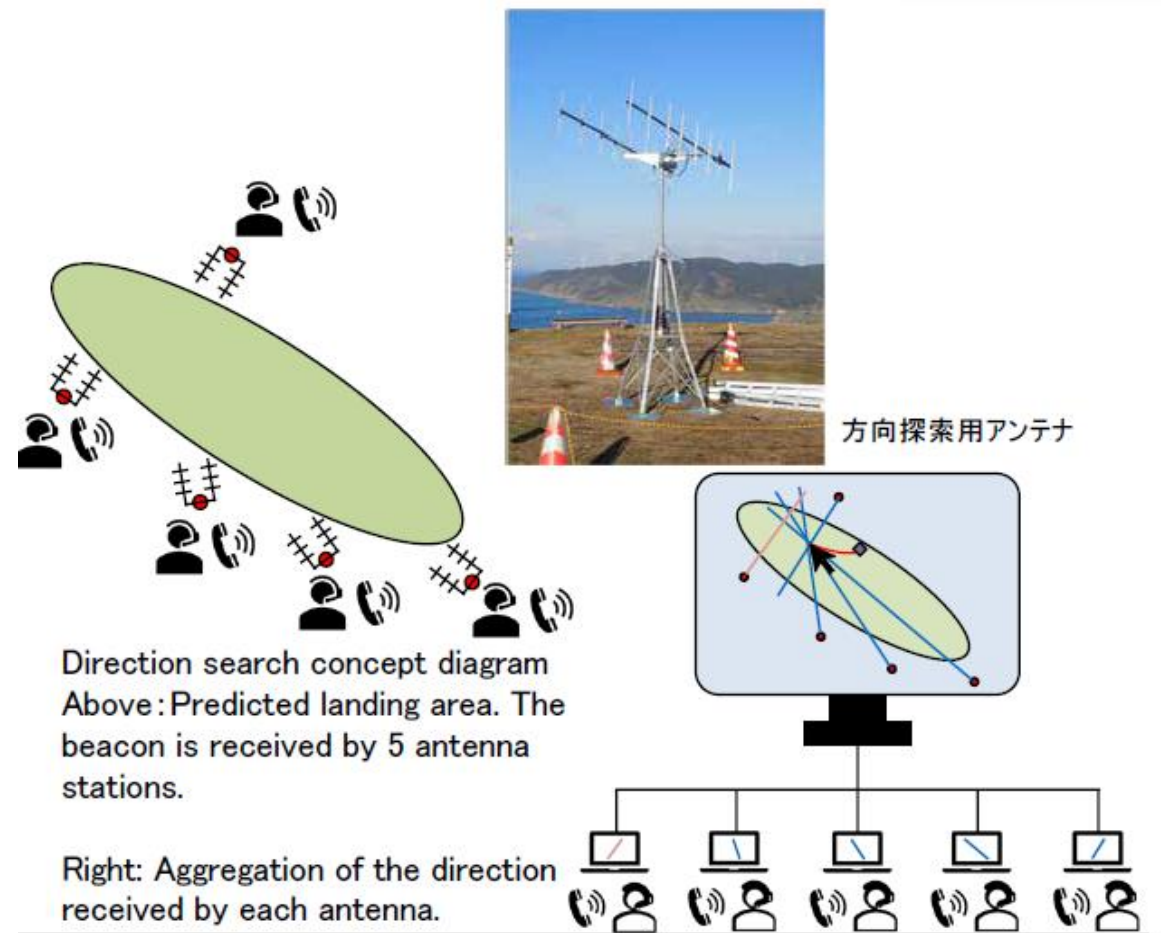
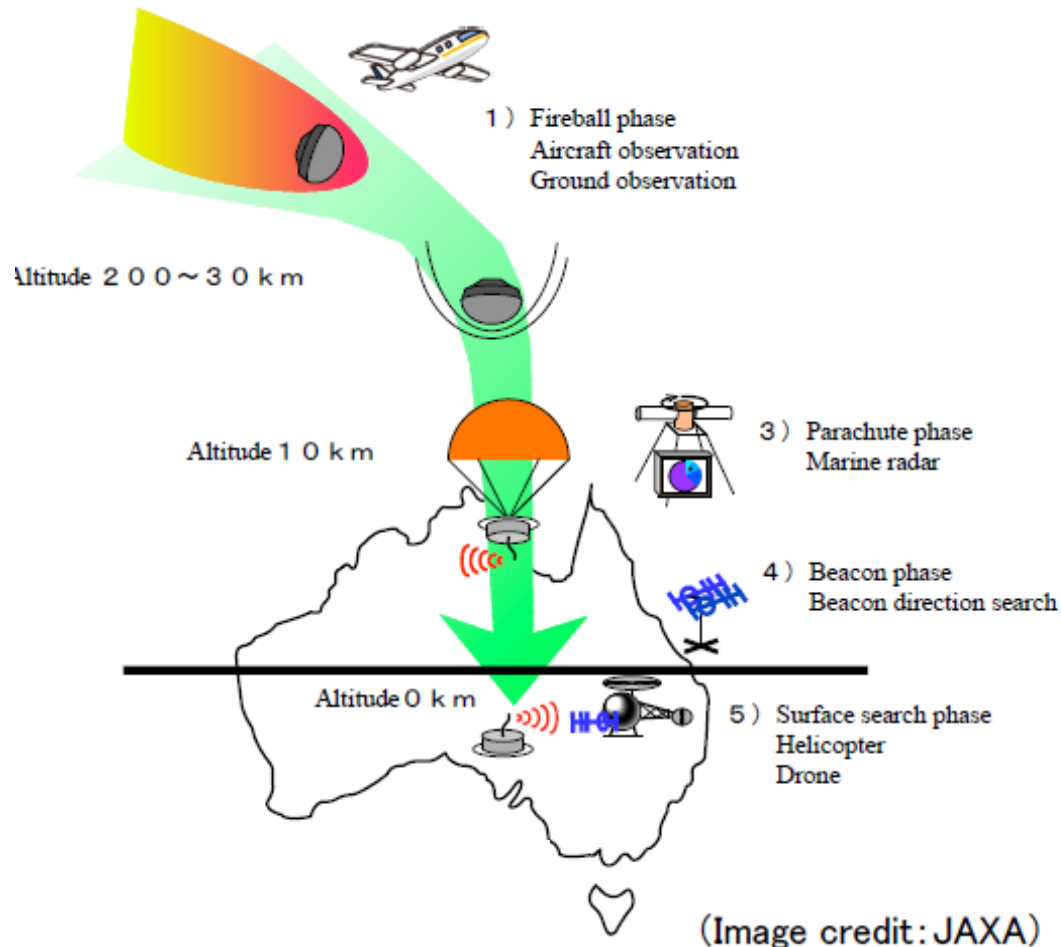
Fireball@40km alt.

- Live footage from Coober Pedy via JAXA webpage



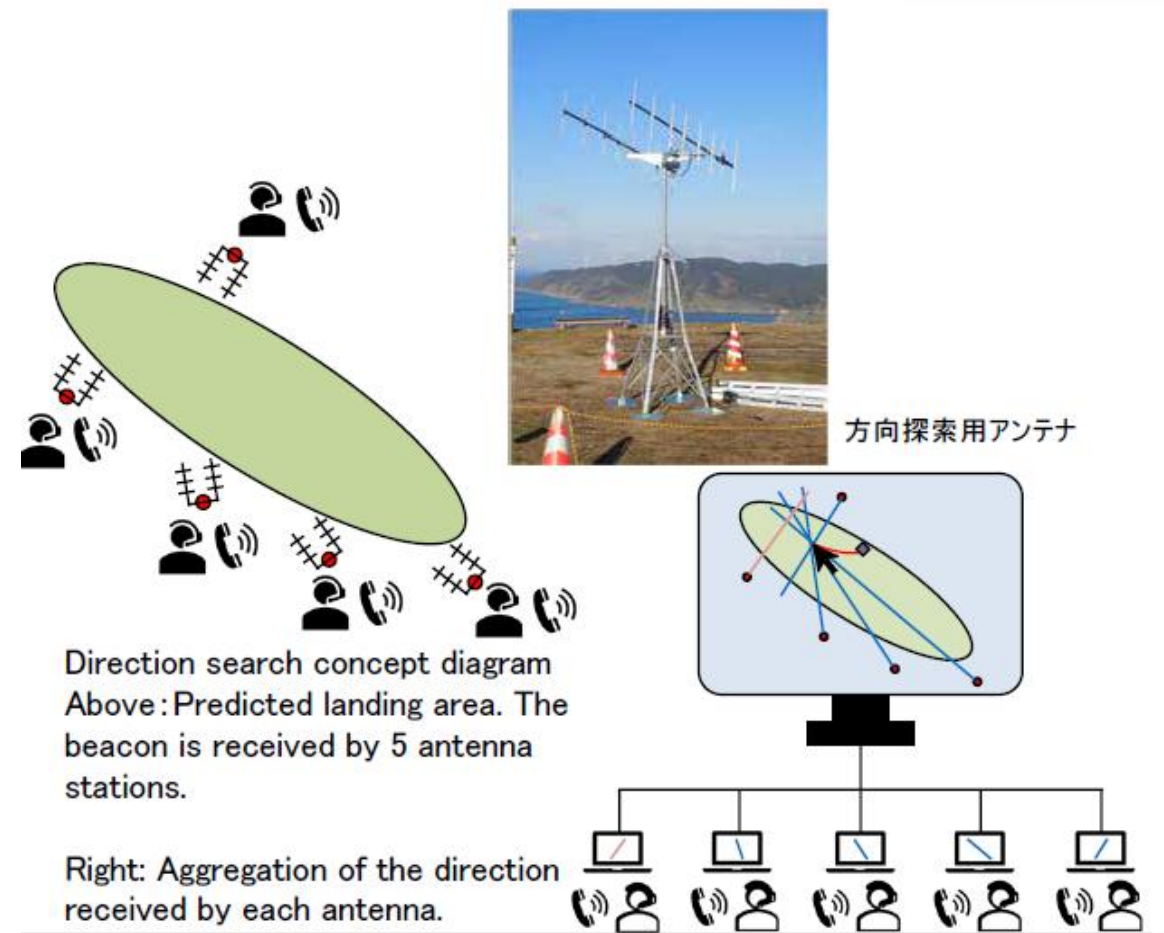
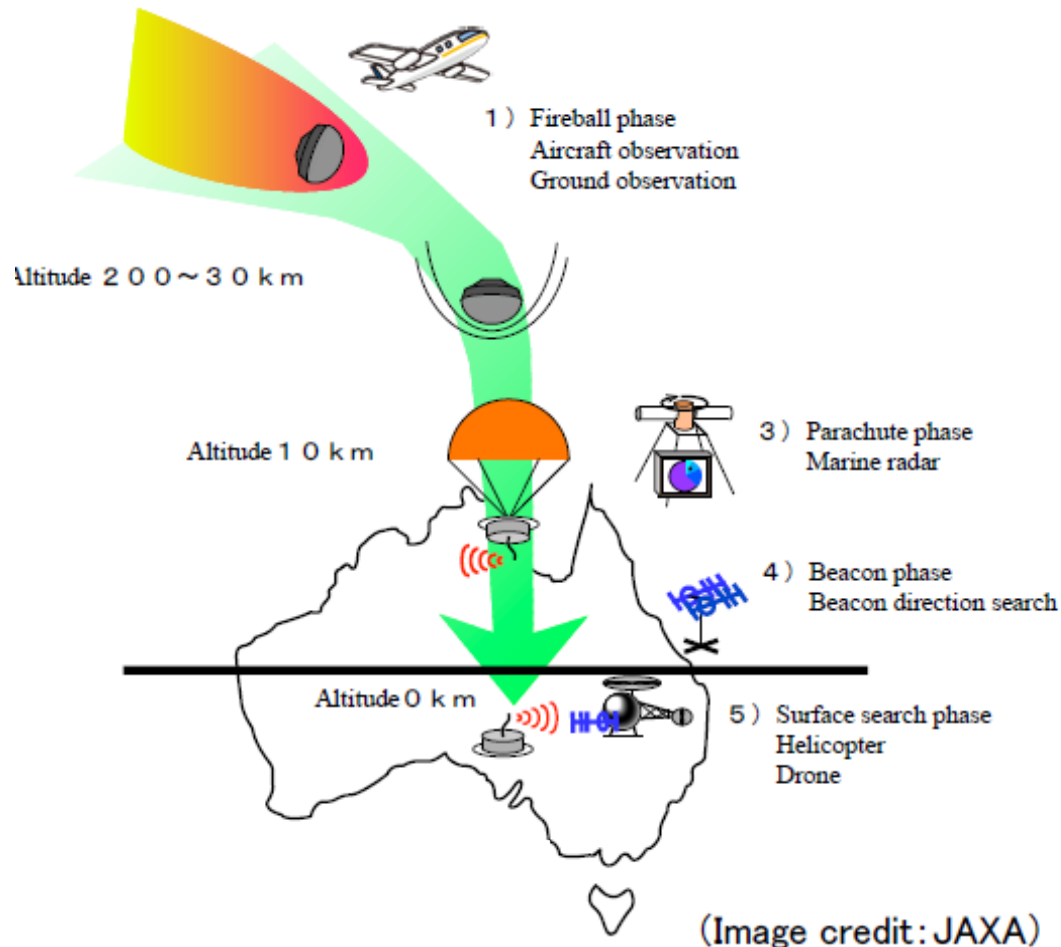
Parachute deployment, Beacon ON @10km alt.

- Triangulate the beacon signal to reconstruct the descent trajectory



Sending a helicopter to the spotted landing site

- Visual confirmation and then drop off the operation crews



December 6, 2020

Discussion with Australian Authorities to obtain landing permission had started in 2018.

Then, **the pandemic** started to cover every corner of the globe in March 2020.

To go or to wait: decision in April 2020.

Go=Carry out the recovery operation in Dec 2020

Wait=delay the reentry for some ***years*** until the situation on the ground becomes clear

December 6, 2020

We decided to carry out the operation in Dec.

The additional hurdles we needed to clear were:

Special entry visa, securing minimum necessary members who can leave home for eight weeks (three weeks in Woomera, five weeks of quarantine in Japan and in Australia), chartered flight, anti-COVID-19 measures, training the team members under stay-at-home regulation, teaming-up the whole team via online meeting, ...

I, Deputy Director General of ISAS, decided to join the team.

December 6, 2020

During the post-arrival quarantine in Adelaide (the capital of South Australia), the whole SA went into **lockdown**.







This is just one of the hurdles we needed to clear with no-huddle. Support from **Australian Space Agency** was crucial in making the way through.

Home > South Australia > NW Pastoral > Woomera > Detailed Forecast

Woomera Weather

31.20°S 136.82°E 156m AMSL

NEXT 48 HOURS IN WOOMERA

	Weather	Temp	Chance of rain	Cloud cover	Wind	Dew point	Humidity
Saturday, December 5							
3pm	 Mostly clear. Windy	29°C	5%	32%	WSW 38km/h	14°C	38%
6pm	 Mostly clear. Windy	28°C	5%	14%	SW 43km/h	9°C	30%
9pm	 Mostly clear. Windy	21°C	5%	15%	SW 33km/h	7°C	40%
Sunday, December 6							
12am	 Mostly clear	17°C	5%	22%	SW 25km/h	7°C	49%
3am	 Mostly clear	14°C	5%	27%	SW 22km/h	6°C	56%
6am	 Mostly clear	12°C	5%	42%	SW 19km/h	5°C	60%

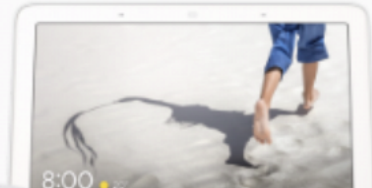
Enter town or postcode... 🔍 ⓘ

SIGN UP weatherzone essential weatherzone pro LOGIN

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Big catch!
5.4g in total.

(Minimum requirement
was 0.1g)



Ryugu sample analysis timeline

- Dec 2020 ~ Summer 2021:
Initial curation
- Summer 2021 ~ Summer 2022:
Initial Analysis
- After summer of 2022:
International AO
- **Comparative study with NASA OSIRIS-REx Bennu samples**
- Feedback to our **next small body sample return** mission **MMX**:
The target is **Phobos**

