IEEE Milestone registration material

Application Achievements through Usuda Deep Space Center and Associated Control System

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ISAS

MitsubishiElectricCorporation

NEC

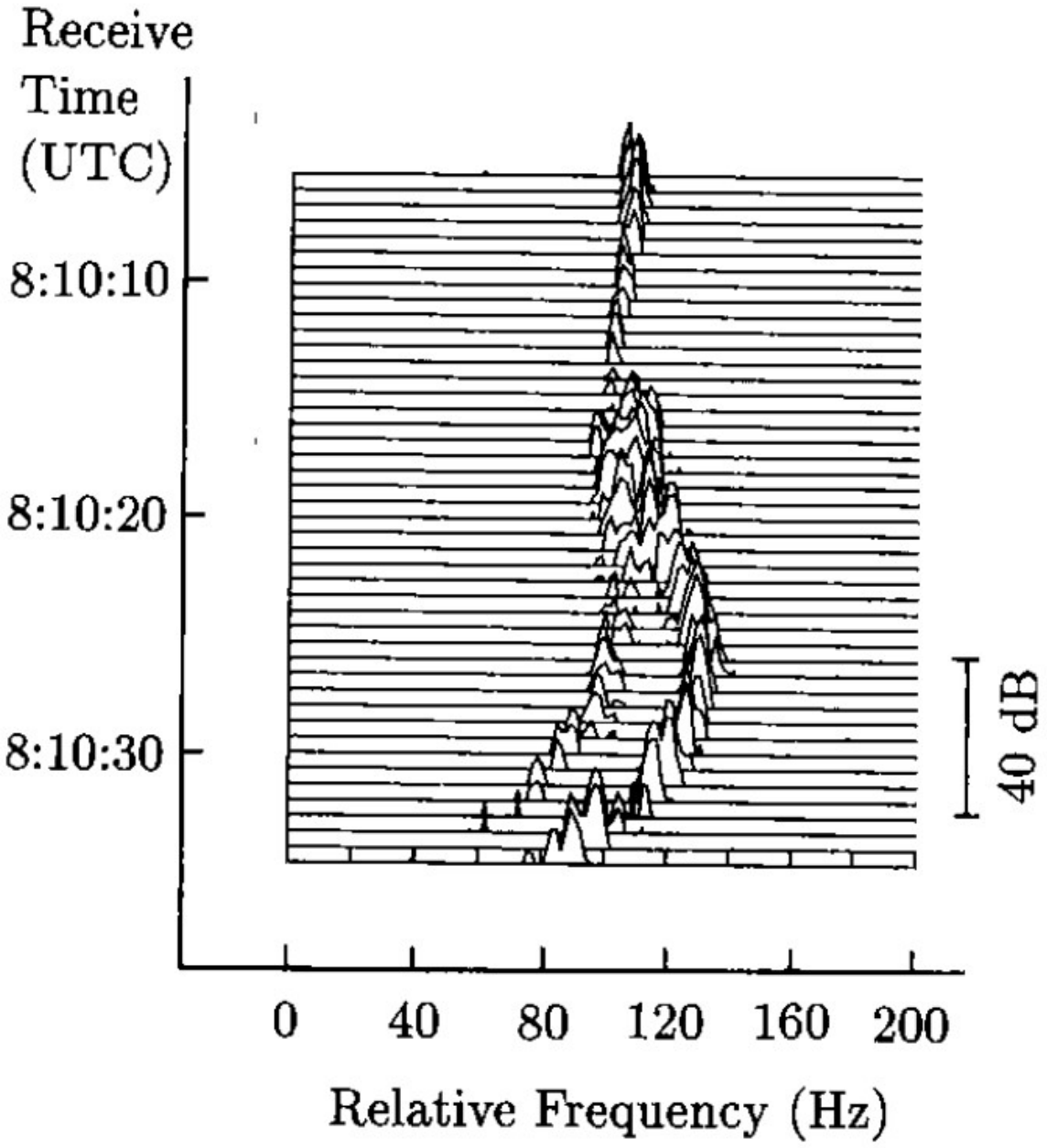
(Proposers: Tadashi Takano and Yashiro Murata)

Listed missions and observations

- Voyager2 in Neptune encounter
- Bistatic Radar System: Detecting Space Debris
- Hayabusa: asteroid explorer
- Kaguya family including Oona and Okina: Lunar probe
- Venus Express and Akatsuki: Venus explorers
- Hayabusa: asteroid explorer

Voyager2 in Neptune encounter

1992 Voyager Radio Science_e75-b_7_665



a of the signal around the multipath region, ing the Canberra 8.4 GHz data after remov- t of $(f_{\text{pred}} - f_{\text{tun}})$ (corresponding to Fig. 3 maining gradual frequency drift, especially 20, is due to $f_{\text{unmodelled}}$.

Fig..

Bistatic Radar System for Detecting Space Debris

Yajima, Earth, Moon, and Planets (2007)

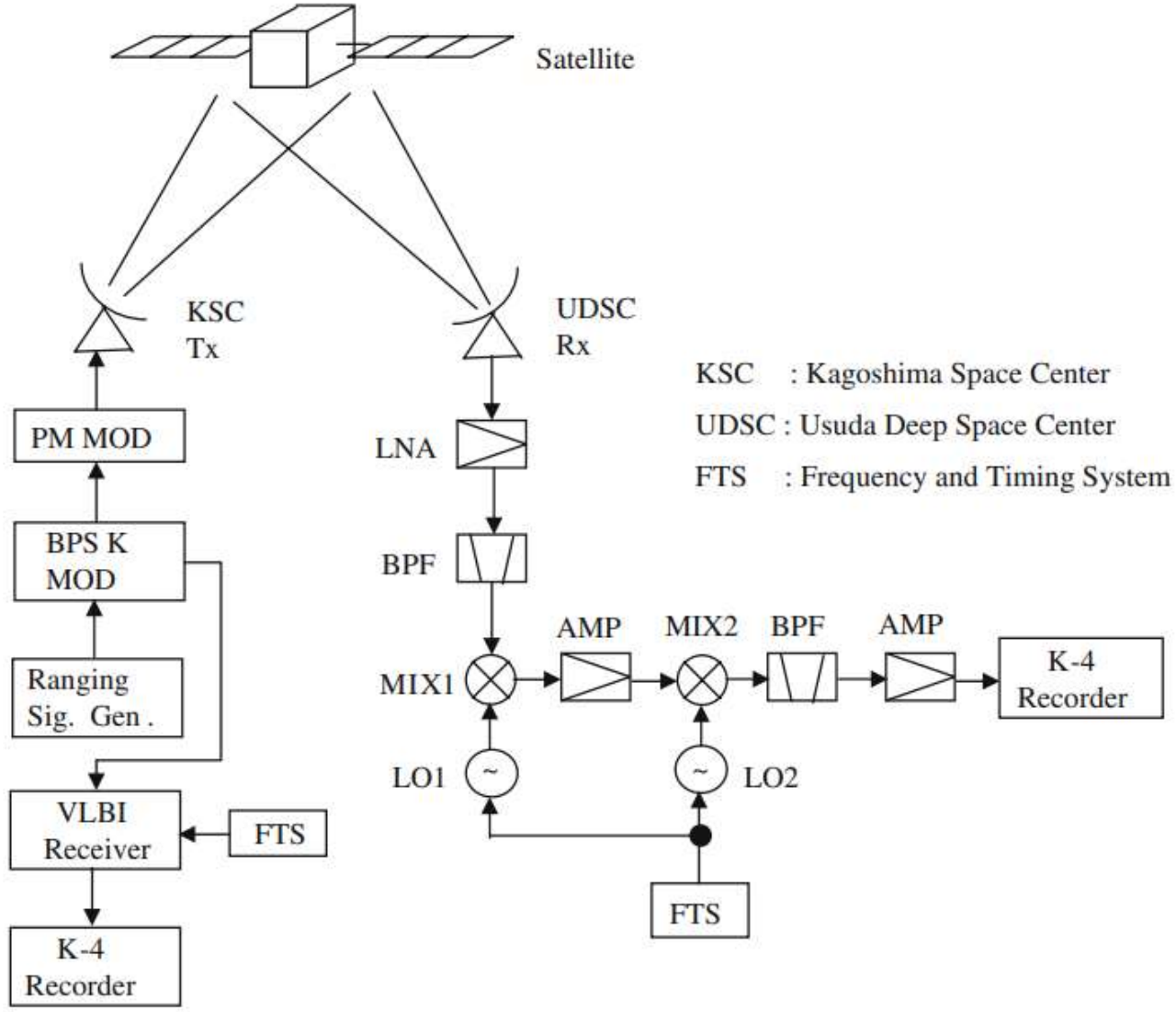


Figure 4. Configuration of the experimental system.

Hayabusa

2015Yoshikawa_Hayabusa_sample return mission

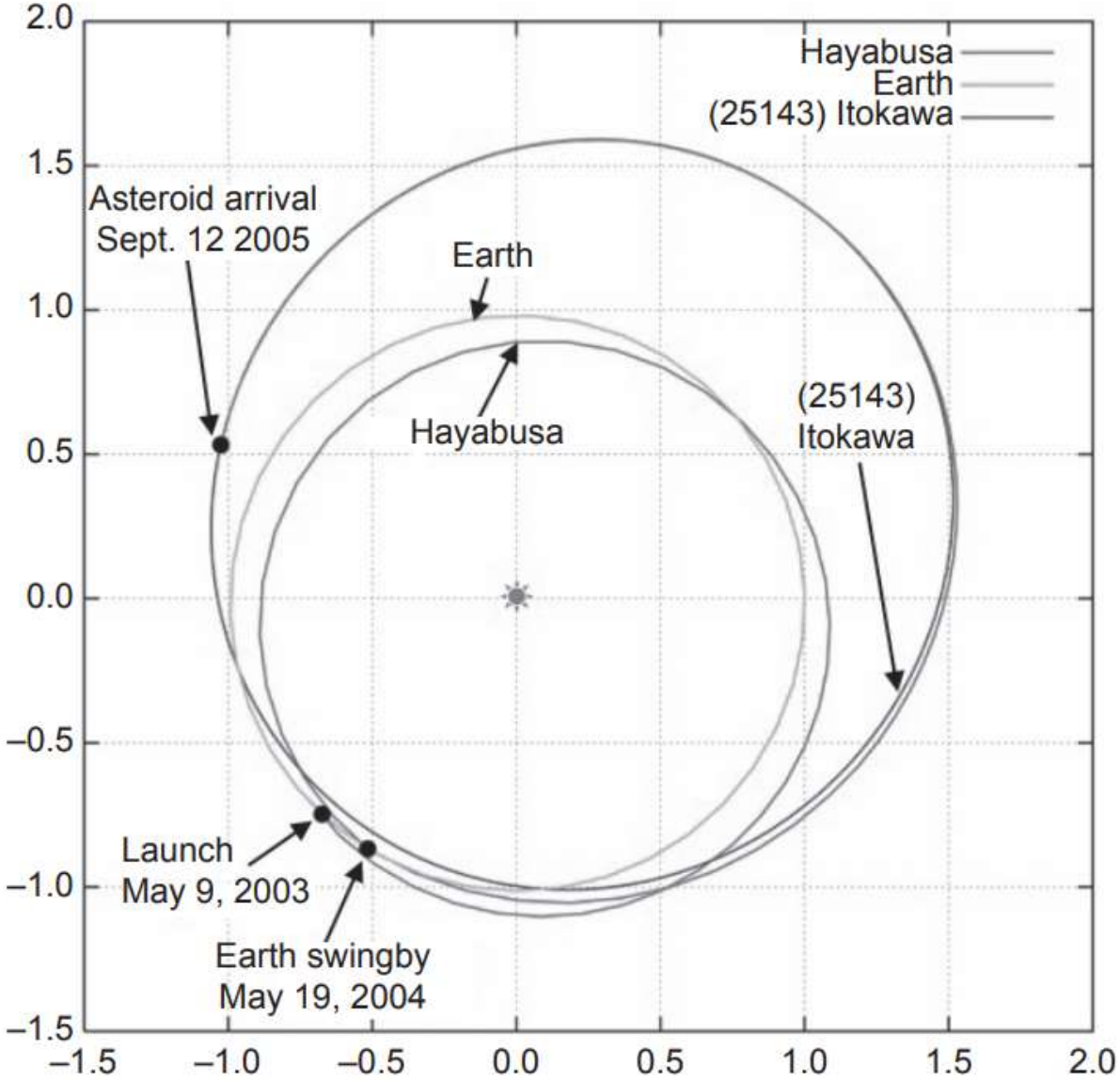


Fig. 1. Orbit of Hayabusa from launch to asteroid arrival. The EDVEGA phase was from launch to Earth swingby, and the transfer phase was from Earth swingby to asteroid arrival.

Hayabusa

2006Yano Touchdown of the Hayabusa Spacecraft at

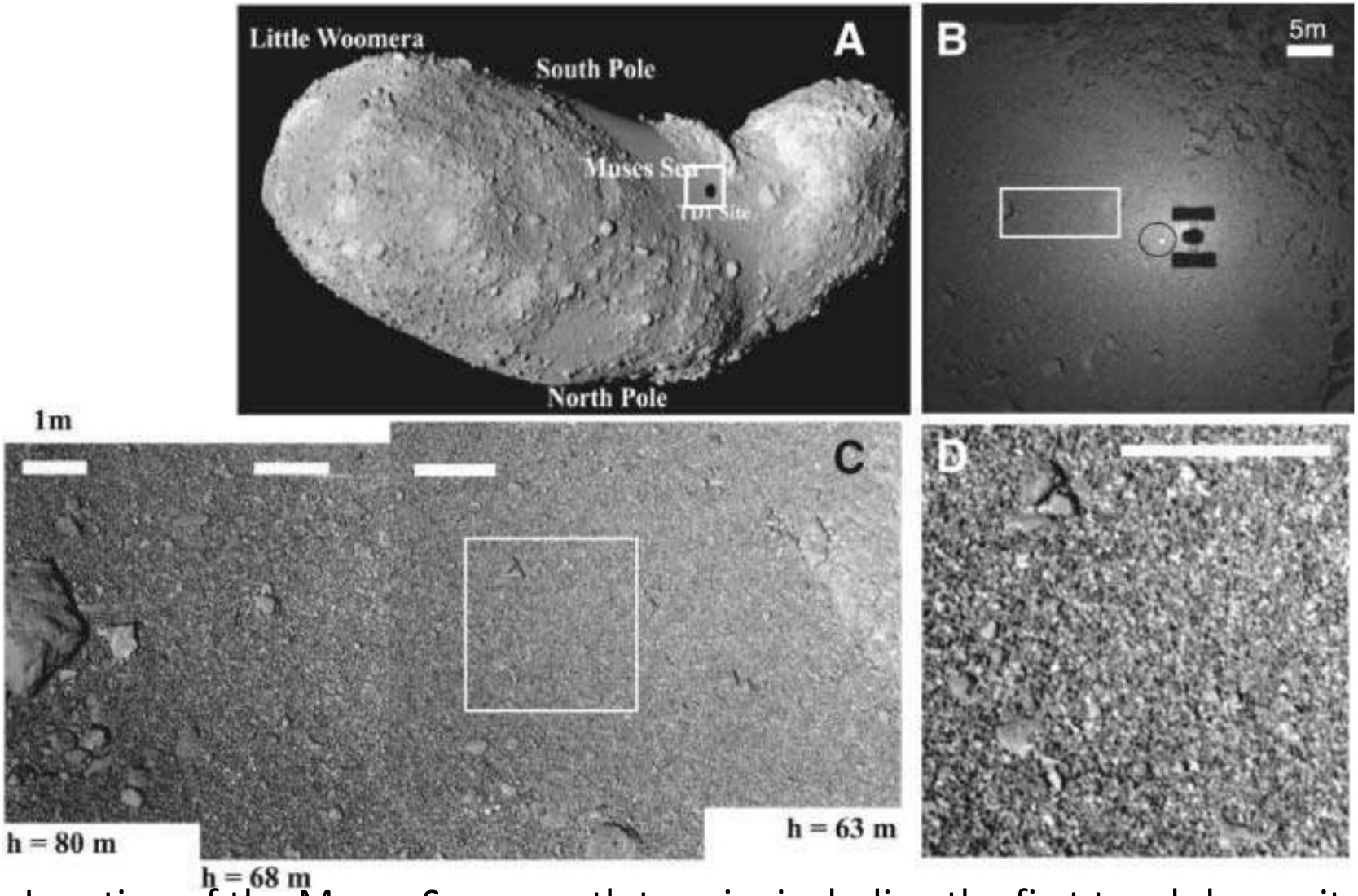
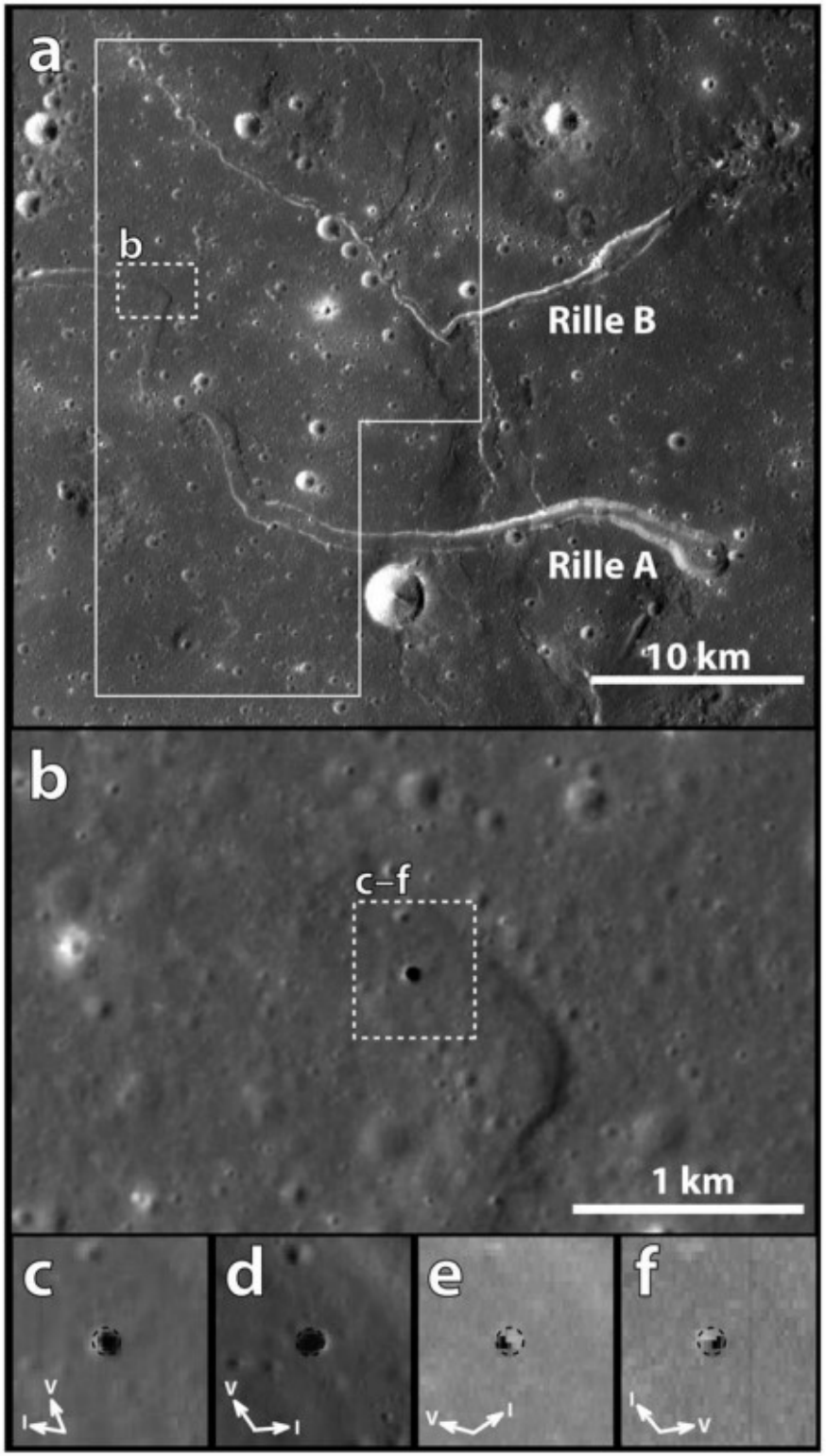


Fig. 1. Location of the Muses Sea smooth terrain, including the first touchdown site on Itokawa. All images were taken in v-band (3). The square in (A) indicates the size of (B); the rectangle in (B) indicates the size of (C); the rectangle in (C) indicates the size of (D). Scale bars in (C) and (D), 1 m.

Itokawa is 550 m by 298 m by 224 m in its circumscribed box size .



Kaguya family
Possible lava tubes of the Moon

J. Haruyama et al., “Possible lunar lava tube skylight observed by SELENE cameras”, Geophysical Research Letters, 2009.)

Figure 1. Images of a possible 65 m diameter lunar lava tube skylight in the Marius Hills taken by SELENE Terrain Camera (TC) and Multi-band Imager (MI). (a) Overview of the region (TC, 20 May 2008). The crater counting area is indicated by a solid white polygon. (b) Marius Hills Hole (MHH) at 303.3E, 14.2N. (c – f) Enlarged TC and MI images of MHH (Figures 1c and 1d are TC images from 20 May 2008 and 21 January 2009; Figures 1e and 1f are MI images from 17 March 2009 and 13 April 2009). See Table 1 for imaging conditions. Arrows indicate the directions of solar illumination (I) and the view vector from the camera (V).

Kaguya family
: Farside Gravity Field of the Moon

(N. Namiki et al.,"Far-side Gravity Field of the Moon from Four-way Doppler Measurements of SELENE (Kaguya)", SCIENCE VOL 323, 2009.)

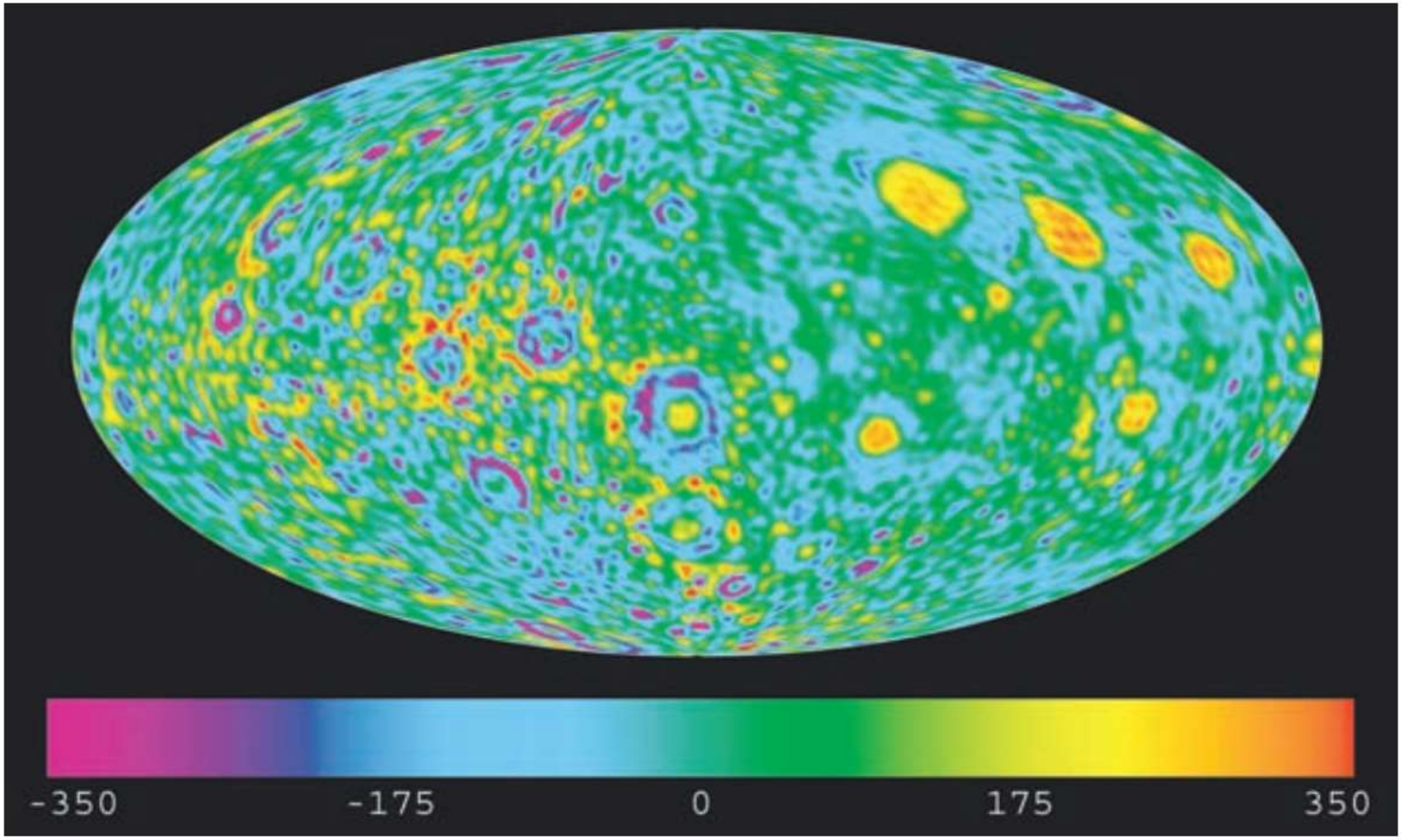
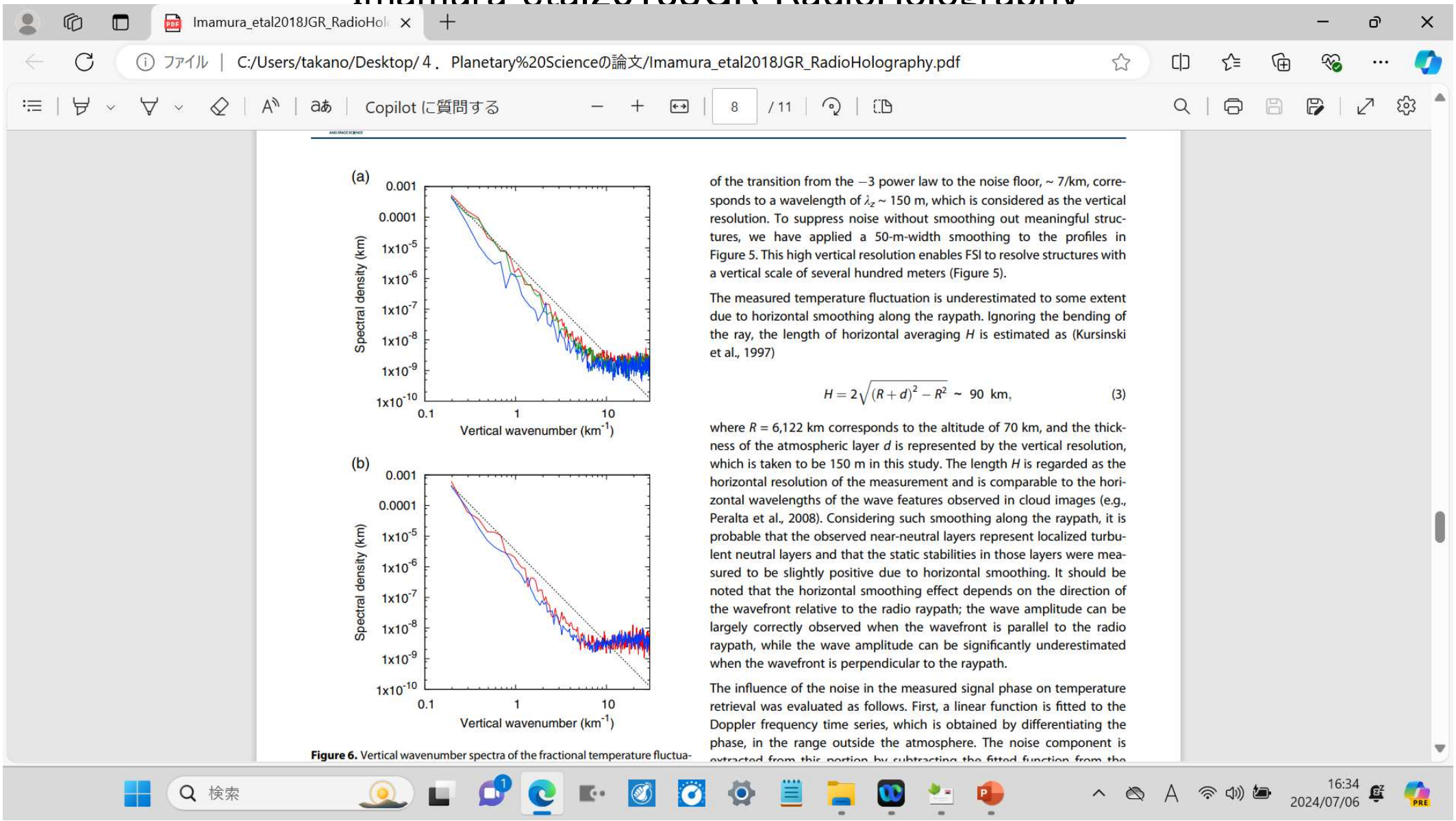


Fig. 2. Free-air gravity anomaly map from SGM90d. The lunar nearside is on the right side of the figure, and the farside is on the left. The color bar indicates the gravity anomaly in milli-Galileo (1 mGal = 10−5 m s−2). The maximum and minimum values of the map are 640 and −720 mGal.

Venus Express and Akatsuki
Imamura_etal2018JGR RadioHolography



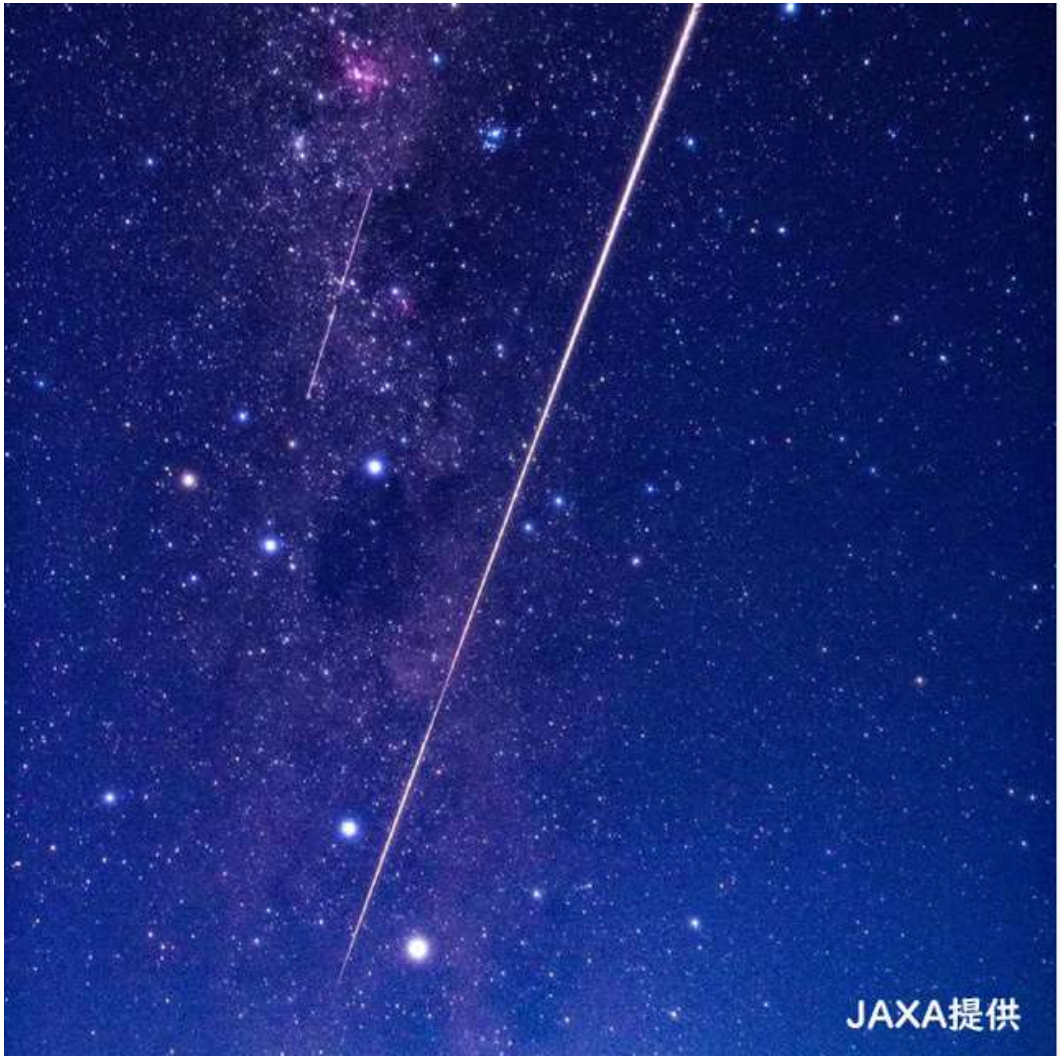
with FSI in the altitude range of 65–75 km in different latitudinal regions obtained from (a) VeRa (blue: <40° ; green: 40° –70° ; red: >70°) and (b) Akatsuki RS (blue: <40° ; red: >40°). The semiempirical spectrum for saturated gravity waves is also shown by dotted lines

Hayabusa2

小惑星探査機6年の旅

複数の小型探査ロボット, 小天体表面の移動探査

着陸精度 60 cm, 人工クレーター, 地下探査



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Hayabusa2
2020Tsuda Hayabusa2 mission status acta astronautica

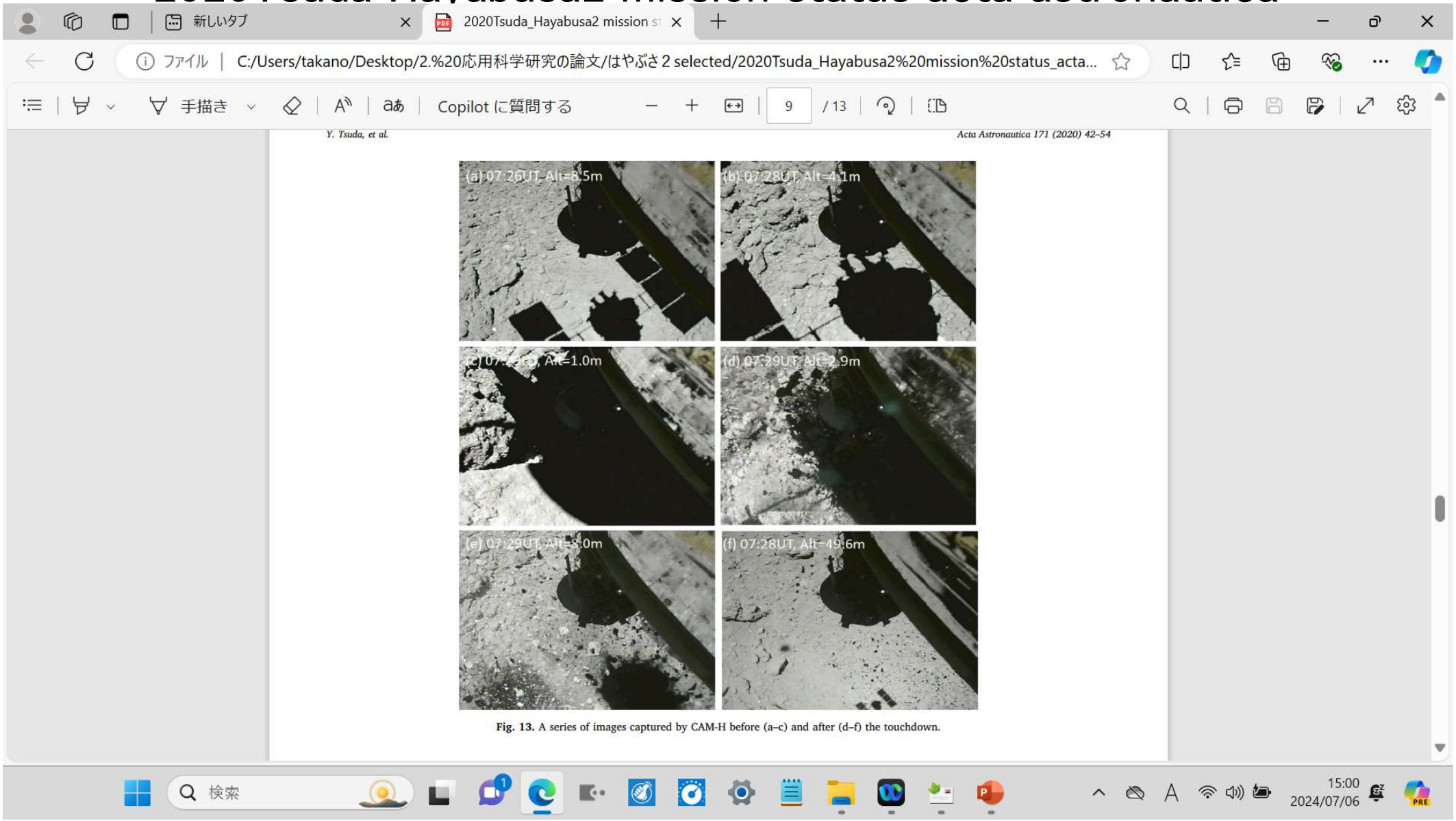

Fig. 13. A series of images captured by CAM-H before (a–c) and after (d–f) the touchdown.

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