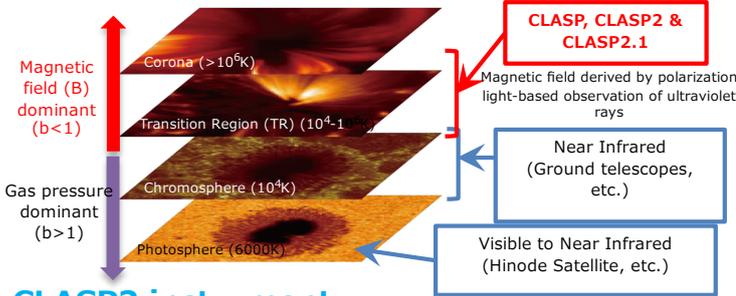




Initial results from the CLASP2.1 sounding rocket experiment

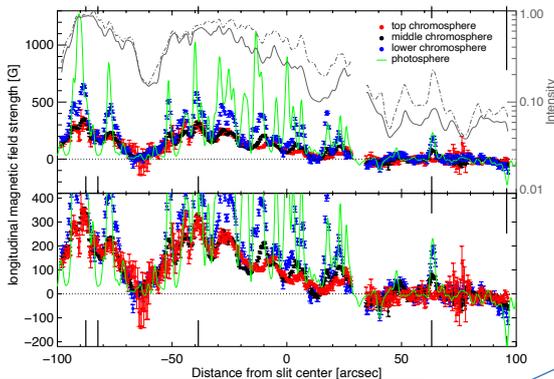
R. Ishikawa, T. Okamoto¹, Song Donguk², David McKenzie³, Javier Trujillo Bueno⁴, Frederic Auchere⁵, R. Kano¹, Uruguchi¹, T. Tsuzuki¹, Ken Kobayashi³, Laurel Rachmeler⁶, Gen Vigil³, Christian Bethge⁷, T. Sakao⁸, CLASP2.1 Team
 (1 国立天文台, 2 KASI, 3 NASA/MSFC, 4 IAC, 5 IAS, 6 NOAA, 7 Univ. of Colorado, 8 ISAS/JAXA)

Scientific motivation and sounding rocket experiment CLASP2.1

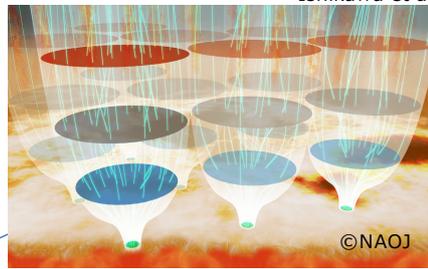


- Japan-U.S.-Europe Joint Experiment using NASA's Observation Rocket. Re-flight plan of CLASP2, an observation rocket experiment launched in April 2019. It will be launched from the White Sands Missile Range (WSMR) in the United States on October 8, 2021, and successfully observed for about six minutes.
- Like CLASP2, CLASP2.1 will measure the magnetic field from the bottom of the chromosphere to the top of the chromosphere by polarized spectroscopy in the ionized magnesium line (280nm) wavelength range.
- In CLASP2.1, a slit scan will be performed operationally to obtain 3-dimensional (2-dimensional space x height) magnetic field information.

CLASP2 instrument



- In combination with the Hinode satellite, which measures the magnetic field of the photosphere, comprehensive observations of the magnetic field of the photosphere (solar surface), the bottom of the chromosphere, the middle of the chromosphere, and the top of the chromosphere will become possible. Ishikawa et al. 2021



US Army Photo, White Sands Missile Range



total length of the instrument: 2.5 m

CLASP2 Observation Equipment	
Observations	I (intensity), Q&U (linear polarization), V (circularly polarized)
Spectral lines	Mg II h & k, Mn I, ... @ 280 nm
Resolution	0.01 nm (λ), 1.1" (spatial)
Slit	200"

See Tsuzuki et al., SPIE (2020) for more information on the instruments.

Activities at WSMR (1.5 months) → launch

After the launch of CLASP2, the recovered CLASP2 instruments were brought to WSMR to start work.

- Installation of the Polarization Modulator Unit (PMU), which was removed for long-term storage
- Reinstalling the telescope
- Checking screw fastening & adhesion

Performance confirmation by optical test

- vibration test

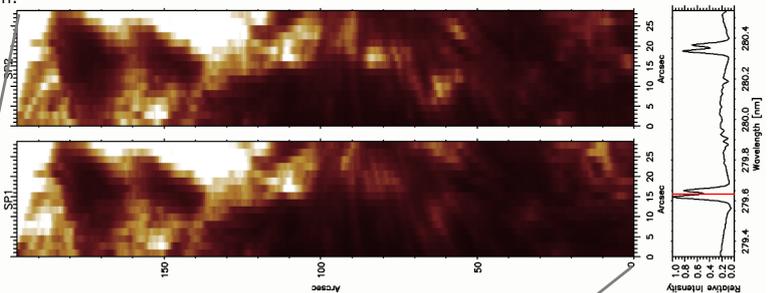
Performance confirmation by optical test

- joint test with the rocket

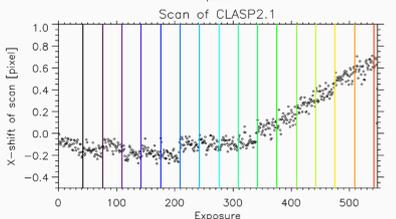
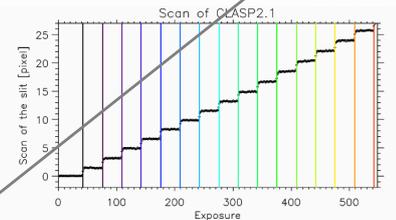
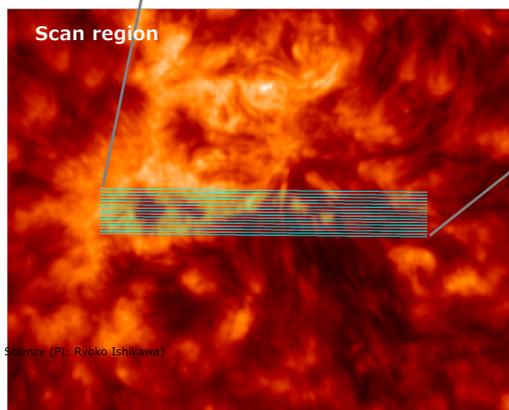
launch

15 sec observation at the center of the Sun for polarization calibration, followed by 330 sec observation of the active region

- The upper part of the chromosphere synthesized from the spectral lines obtained at each slit position.



- Scan an active area of 200 "x28" in 16 locations



今後

- Polarization spectra ($Q(\lambda)$, $U(\lambda)$, $V(\lambda)$) are derived by demodulating the observed data and calibrating the polarization.
- Derive the magnetic field using the method established by CLASP2, and obtain the 3D magnetic field from the photosphere to the top of the chromosphere by combining it with Hinode satellite observations.

Support for the development and research of CLASP2 in Japan:
 2017-2019 JAXA Small-Scale Solar Observation Project (CLASP2+SUNRISE-3)
 2016-2018 JSPS Kakenhi JP16H03963 (Basic Research (B) Principal Investigator: Ryoko Ishikawa)
 2016 NAOJ Joint Development Research (PI: Shinnosuke Ishikawa)
 2015 International Joint Mission Promotion Expenses, National Institute of Space and Astronautical Science (PI: Ryoko Ishikawa)
 2013-2017 JSPS Kakenhi JP25220703 (Basic Research (S) PI: Saku Tosada)
 2019-2021 JSPS Kakenhi JP19K14771 (Principal Investigator: Ryoko Ishikawa)
 2019-2021 JSPS Kakenhi 19K03935 (Basic Research (C) PI: Ryouhei Kano)
 2021-2023 JSPS Kakenhi 21H01138 (Basic Research (B) PI: Ryouhei Kano)
 2020-2022 JSPS Kakenhi 20K04019 (Basic Research (C) PI: Takenori Okamoto)
 For more information about CLASP2 and other achievements, please visit https://solarw.mtk.nao.ac.jp/Rocket_balloon_experiments/CLASP2/index_j.html

Very high attitude stability ($< \pm 0.1''$ @ each slit position)