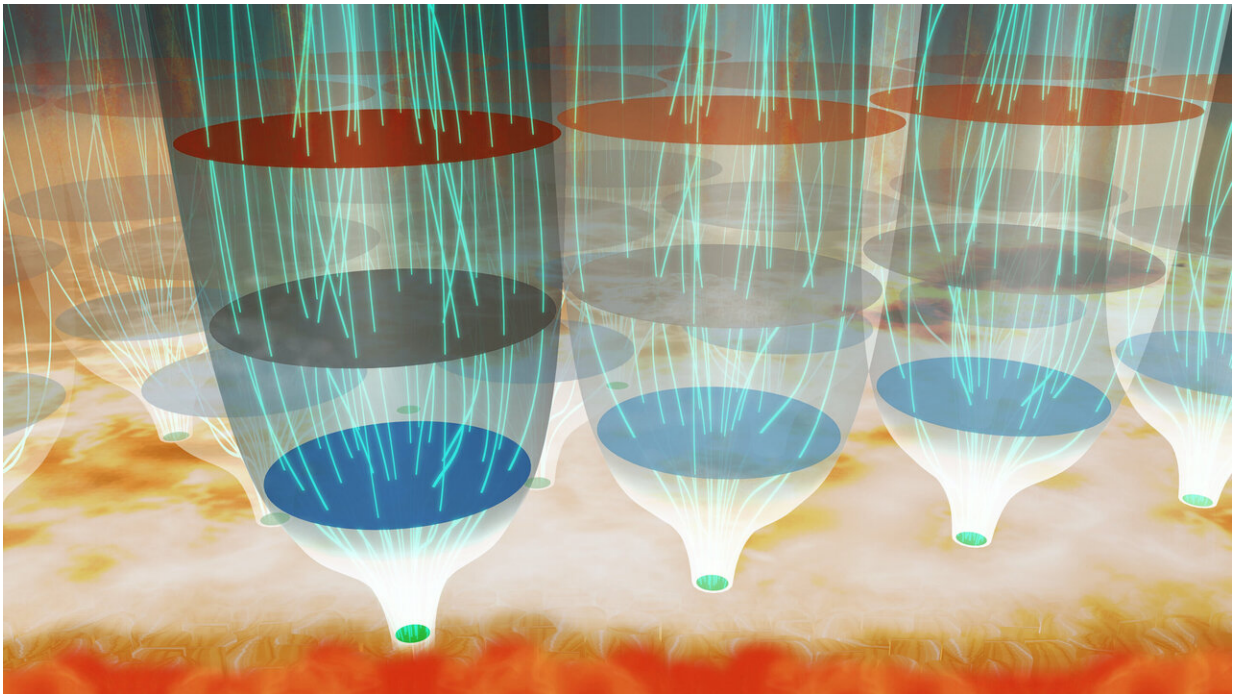


# Sounding rocket CLASP2 elucidates solar magnetic field

February 19 2021

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Measuring the magnetic field strength at four different heights (horizontal planes) by using data from the CLASP2 and Hinode space telescopes allowed astronomers to map the spreading of magnetic field lines (shown in green) in the chromosphere. Credit: NAOJ

Cooperative operations between a solar observation satellite and a sounding-rocket telescope have measured the magnetic field strength in the photosphere and chromosphere above an active solar plage region.

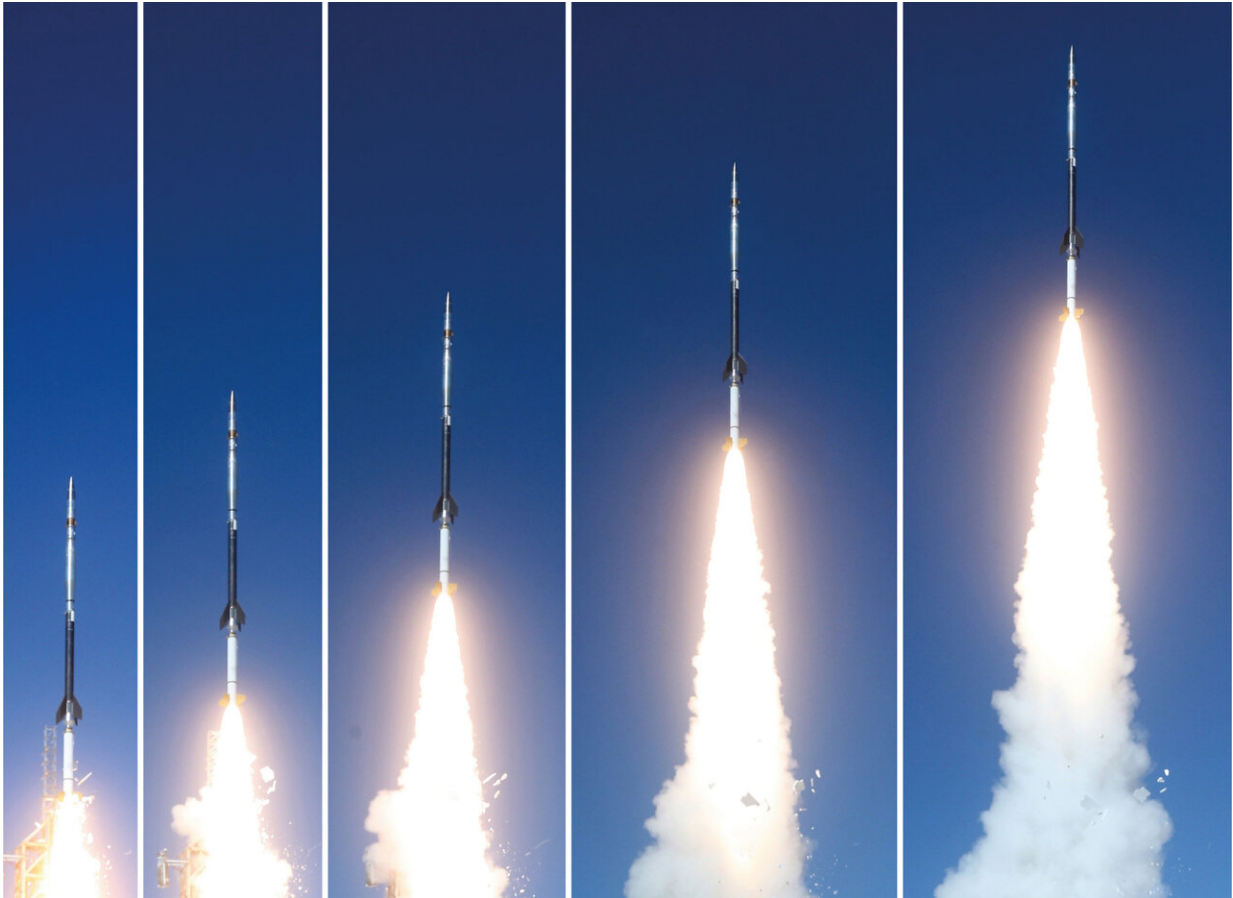
This is the first time that the magnetic field in the chromosphere has been charted all the way up its top. This finding brings us closer to understanding how energy is transferred between layers of the Sun.

Despite being the brightest object in the sky, the Sun still holds many mysteries for astronomers. It is generally believed that magnetic fields play an important role in heating the [solar corona](#), but the details of the process are still unclear. To solve this mystery it is important to understand the magnetic field in the chromosphere, which is sandwiched between the corona and the photosphere, the visible surface of the Sun.

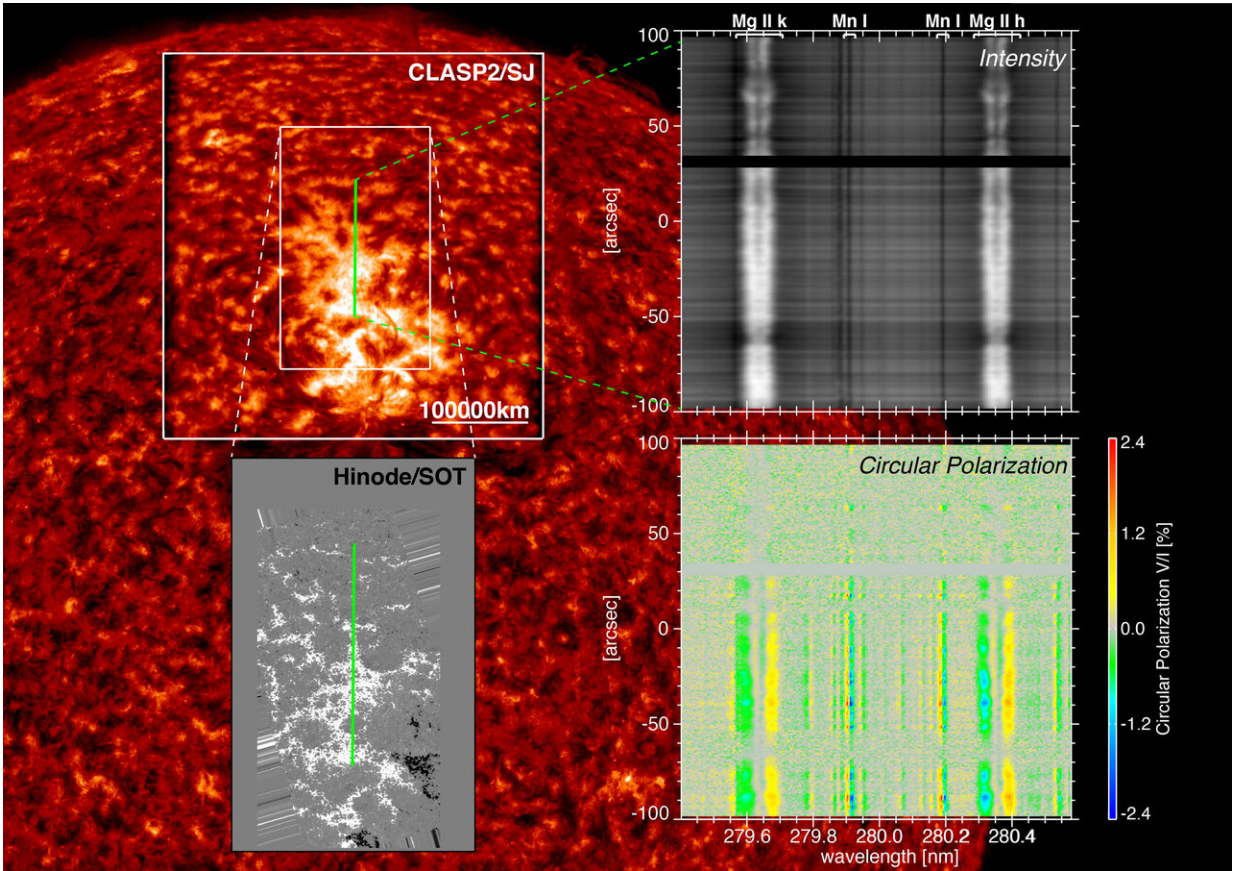
An international team led by Ryohko Ishikawa, an assistant professor at the National Astronomical Observatory of Japan, and Javier Trujillo Bueno, a professor at the Instituto de Astrofísica de Canarias, analyzed data collected by the CLASP2 sounding rocket experiment over six-and-a-half-minutes on April 11, 2019. They determined the longitudinal component of the magnetic field above an active region plage and its surroundings by analyzing the signature that the magnetic field imprinted on ultraviolet light from the chromosphere.

The unique high precision data from CLASP2 allowed the team to determine the magnetic field strengths in the lower, mid, and upper regions of the chromosphere. Simultaneously acquired data from the Japanese solar observation satellite Hinode provided information about the magnetic field in the plage itself in the photosphere. The team found that the plage [magnetic field](#) is highly structured in the [photosphere](#) but expands, rapidly merging and spreading horizontally, in the [chromosphere](#). This new picture brings us closer to understanding how magnetic fields transfer energy to the corona from the lower layers of the Sun.

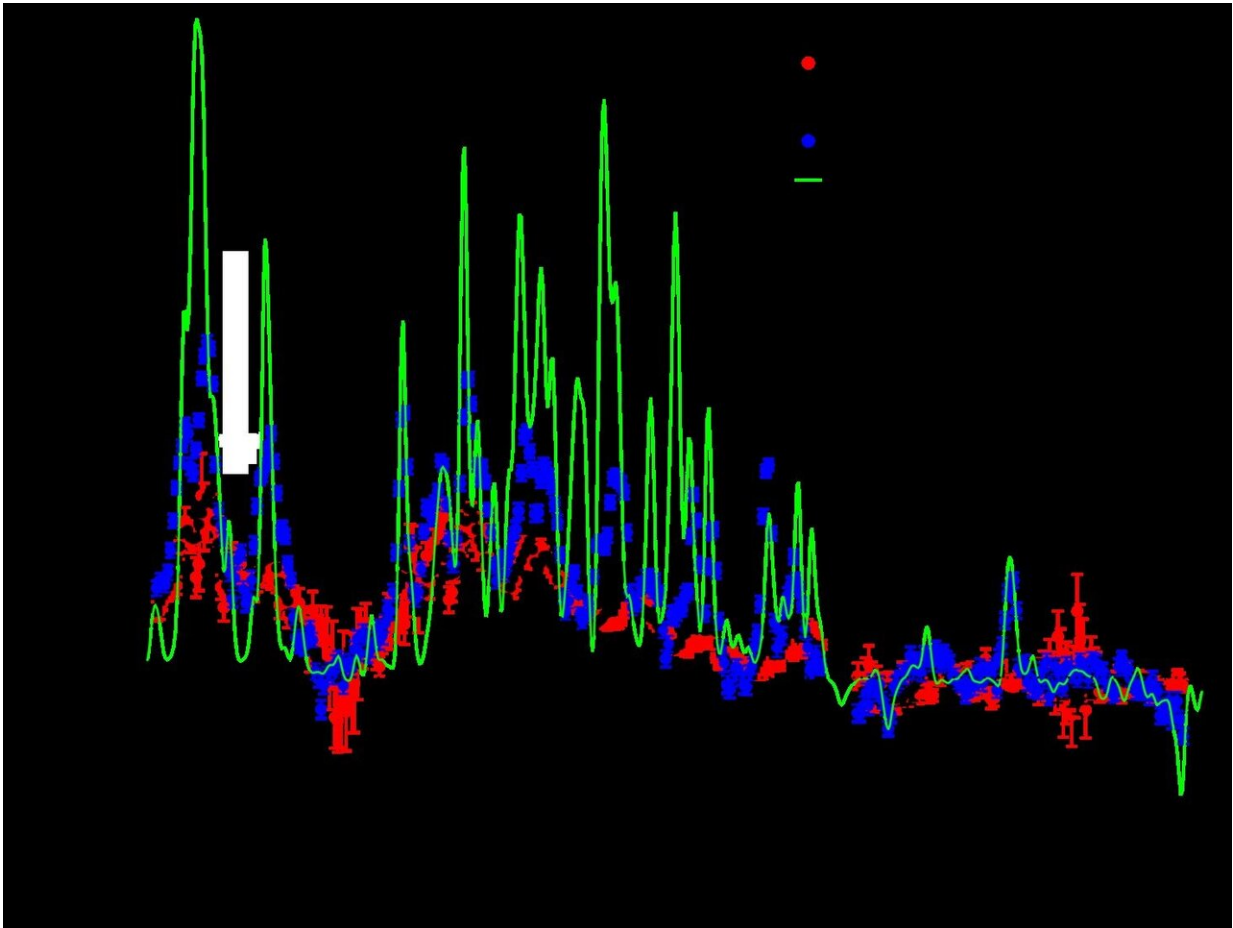
The study is published in *Science Advances*.



CLASP2 launch. Credit: US Army Photo, White Sands Missile Range



CLASP2 and Hinode data used in the study. The background is the image taken by the Solar Dynamics Observatory (SDO) satellite. Credit: NAOJ, NASA, IAC, IAS



Longitudinal component of the magnetic field (in gauss) at each point along the spatial direction indicated by the green line in the left panels of figure 1. The strongest and weakest magnetic fields are found in the photosphere (green curve), where there are strongly magnetized regions (up to 1250 gauss) separated by others that are weakly magnetized (10 gauss). This substantial variation in the magnetic field intensity when moving horizontally in the photosphere decreases at heights corresponding to the lower chromosphere (blue symbols) and is even smaller in the intermediate (black symbols) and outer (red symbols) layers of the chromosphere. These results confirm and prove that, in such active regions of the solar atmosphere, the lines of force of the magnetic field expand and fill the whole chromosphere before reaching the base of the corona. Credit: NAOJ, IAC, NASA/MSFC, IAS.

**More information:** R. Ishikawa et al., "Mapping solar magnetic fields from the photosphere to the base of the corona," *Science Advances* (2021). [advances.sciencemag.org/lookup.../1126/sciadv.abe8406](https://advances.sciencemag.org/lookup.../1126/sciadv.abe8406)

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