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The Chinese Hα Solar Explorer and its early results

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As the first solar space mission of China National Space Administration, the Chinese Hα Solar Explorer (CHASE) [1], was successfully launched on 2021 October 14. The scientific payload of the CHASE mission is an Hα Imaging Spectrograph (HIS), which acquires full-Sun spectroscopic observations at Hα (6559.7 – 6565.9 Å) and Fe I (6567.8 – 6570.6 Å) wavebands. The full-Sun raster scanning takes only 46 seconds, with a spectral sampling of 0.024 Å and a spatial resolution of 1.2 arcsec [2]. From the two-dimensional spectra of each scanning, we can reconstruct more than three hundred monochromatic images at different wavelengths across the observed wavebands, whose emissions are from different layers from the lower photosphere to the upper chromosphere, as shown in Figure 1. The high spectral resolution of the spectra enables us to derive the Dopplergrams in the photosphere and chromosphere with a high accuracy, which are important for diagnosing the plasma flows in the solar atmosphere. The CHASE is now performing excellent in orbit. The Level 1 science data are available to the community through the Solar Science Data Centre of Nanjing University (https://ssdc.nju.edu.cn).

The scientific objectives of the CHASE mission are to explore the dynamics of solar eruptions, e.g., flares, eruptive filaments, and coronal mass ejections, in the photosphere and the chromosphere, the mass and energy flows from the lower to the upper solar atmosphere, and the Sun-as-a-star spectroscopic properties of the eruptions.

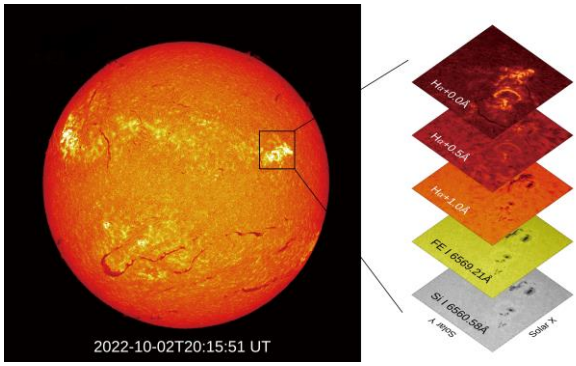

Figure 1. CHASE spectroscopic observations. The left panel shows the full-Sun image at the Hα line center. The right panel shows the active-region images at five typical wavelengths across the observed wave bands.

Here we report some early results of the CHASE mission, including the differential rotation of the solar atmosphere [3], the three-dimensional kinetics of solar filament [4], the source regions of the solar wind [5], etc. We hope the China's first step into the space solar physics will bring some new insights, to unveil the mysteries of the Sun.

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References

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