The Sunrise III UV Spectropolarimeter and Imager: New High-Resolution Data of our Sun in the Near-UV

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In July 2024 the balloon-borne solar observatory Sunrise successfully completed its third science flight. The stratospheric observatory carried three entirely new post-focus science instruments, all with full spectropolarimetric capabilities, and concurrently covering an extended spectral range from the near ultraviolet (down to 309 nm) to the near infrared (up to 855 nm), largely unaffected by seeing and absorption caused by the Earth's atmosphere. The focus of the significantly upgraded Sunrise III was on sampling a larger height range, from the low photosphere to the chromosphere, providing information on the height-dependent interaction between the magnetic field and hydrodynamic processes. This was achieved close to the diffraction-limited resolution of the Sunrise 1-m telescope, and includes datasets spanning several hours for studies of solar dynamics. The Sunrise UV Spectropolarimeter and Imager (SUSI) is a scanning slit spectrograph covering the range between 309 nm and 417 nm. This extended window includes spectral regions showing a high density of spectral lines, which have so far not been explored at high spatial resolution. A key capability of SUSI is its ability to record up to several hundred spectral lines simultaneously. The rich SUSI spectra can be exploited in terms of many-line inversions and are expected to provide a three-dimensional view of the solar atmosphere with unprecedented height resolution and level of detail. In addition to the spectrograph SUSI also includes a 2D context imager, with two phase-diversity channels for image restoration. In this contribution we describe the main design aspects of SUSI as well as its operation and in-flight performance. We also provide an overview of the extensive dataset as well as briefly highlight a few first results that have already been obtained by the Sunrise team.