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The Sunrise UV spectropolarimeter and imager

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Solar activity is mainly driven by its magnetic field, which is structured on small scales. Consequently, detailed measurements of the solar magnetic field and plasma at small scales are required to answer some of the most difficult open questions in solar physics, many of which have important technological and social implications due to the strong Sun-Earth connection. Sunrise is a 1-m optical solar observatory carried aloft by a stratospheric balloon, that was developed to reach such a challenging measurement regime. Its main purpose is to avoid most of the seeing and absorption introduced by Earth's atmosphere to study magnetic fields and plasma flows in the Sun with very high spatial resolution and sensitivity. After two successful campaigns in 2009 and 2013, a new Sunrise flight is under preparation. The Sunrise III post-focus instrumentation has been completely renewed and includes three full-Stokes spectropolarimeters that simultaneously cover wavelengths from 314 to 860 nm, to probe magnetic fields at different heights in the solar photosphere and chromosphere. The most novel of these new instruments is the Sunrise UV Spectropolarimeter and Imager (SUSI). It is a single-slit grating spectrograph that operates in the 314-430 nm spectral range. SUSI aims at acquiring, for the first time, high-spatial-resolution maps of the solar magnetic field in the UV, making use of thousands of spectral lines that are not accessible from the ground. SUSI incorporates a dual-beam polarimeter based on a rotating wave-plate and a synchronous phase-diversity, wide-band channel used for context measurements and image restoration. We present the contributions of the partner group established in 2021 between the Max Planck Institute for Solar system Research and the University of Mendoza, Argentina, to the instrumental development and data reduction of SUSI. These include the specification, characterization and validation of the scientific cameras, development of instrumental simulation codes to support instrument design, polarimetric calibration, specification of the in-flight calibration sequences, and development of data reduction and analysis routines, among others.