The SUNRISE Ultraviolet Spectropolarimeter and Imager: Observations and Data Reduction

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Solar activity is fundamentally driven by its magnetic field, which is structured on small scales (10^4 - 10^5 times smaller than the solar diameter) and dynamically evolves throughout the solar atmosphere. Consequently, detailed measurements of the solar magnetic field and plasma at small spatial scales and multiple heights are required to answer some of the most difficult open questions in solar physics. Sunrise is a 1-m optical solar observatory carried aloft by a stratospheric balloon that studies magnetic fields and plasma flows with very high spatial resolution and sensitivity, by avoiding most of the seeing and absorption introduced by Earth's atmosphere. The third science flight of Sunrise took place in July 2024. The novel post-focus instrumentation includes three full-Stokes spectropolarimeters that cover wavelengths from ≈309 to 855 nm, to simultaneously probe the solar photosphere and chromosphere with remarkable height coverage. The Sunrise UV Spectropolarimeter and Imager (SUSI) is a scanning slit-spectrograph that operates in the 309-417 nm spectral range. SUSI includes a dual-beam polarimeter based on a rotating wave-plate and a synchronous phase-diversity, wide-band context channel used for image restoration. During the Sunrise III flight, SUSI acquired unprecedented high-spatial-resolution maps of the solar polarization in the near UV, observing hundreds of spectral lines that are not accessible from the ground. In this poster, we summarize the ≈ 87 h of observations, including ≈ 57 h of multiple science targets, recorded by SUSI with a constant full-stokes cadence of 0.256 s. We also detail the ongoing data reduction efforts and expected data products.