

SPEXone on-ground and in-flight polarimetric and radiometric performance and trending

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SPEXone is the multi-angle spectropolarimeter onboard the NASA PACE mission [1] and has been operating in-orbit from February 2024 onwards. SPEXone is providing multi-angle radiance and polarimetric data between 385 and 770 nm at 2 nm and 10-40 nm spectral resolution, respectively. Its swath covers 100 km at each of the 0°, ±20° and ±50° views (at instrument level), and is acquired with a spatial resolution of 4.6 x 5.4 km (along-track x across-track) at an oversampling ratio of 2, allowing regridding to a 5.2 x 5.2 km spatial grid that is commonly defined for all three PACE instruments. This data has allowed accurate aerosol retrievals from space [2] and paves the way for constraining climate model parameters to reduce uncertainties in radiative forcing [3].

In this talk we present the polarimetric and radiometric performance of SPEXone, both as measured on-ground and as assessed in-flight, and detail the required calibration steps to achieve this performance. We show that the polarimetric accuracy is better than 0.003 RMS for degrees of linear polarization (DoLP) ≤ 0.35 and discuss how the accuracy at higher DoLP's is reduced due to detector artifacts, especially at low signal levels. We present the algorithms for monitoring the polarimetric zero point and scaling factor using vicarious scenes and the in-flight trending of these quantities. For radiometry, we present a comparison with OCI to show an agreement of better than 2.5% for most of the spectral range. In addition, we demonstrate a near flat trending over the mission duration so far. Finally, we assess the polarimetric and radiometric data quality in terms of fit residuals from the aerosol retrieval algorithm to show that the systematic uncertainty is generally within the goal requirements for DoLP (<0.003) and radiance (<2%), while the stochastic uncertainty dominates at lower signal levels, especially over ocean beyond ~600 nm.

References

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Preferred mode of presentation: Oral