

The Stratospheric Aerosol and Gas Experiment (SAGE) IV Pathfinder

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Atmospheric aerosols and ozone are designated as observing system priorities in the 2017–2027 Decadal Survey report². Accurate records of stratospheric aerosols are a vital piece of the puzzle regarding climate change. Stratospheric ozone has been the subject of observation and research for decades. Its importance is exhibited in the United States Clean Air Act³, which mandates that NASA monitor atmospheric ozone. Measurements from satellites provided data on the initial decline of ozone in the late 1970s and early 1980s that supported the adoption of the Montreal Protocol, and current observations hint at a potential recovery. Adequate determination of that recovery requires continuous and, in the case of multiple instruments, overlapping data records. However, most current satellite systems are well beyond their expected lifetimes, and so we look towards the future of satellite observations of stratospheric ozone and aerosols to develop the Stratospheric Aerosol and Gas Experiment (SAGE) IV Pathfinder. Enabled by the NASA Earth Science Technology Office's Instrument Incubator Program, the SAGE IV Pathfinder project will develop and validate a technology demonstration that will pave the way for a future SAGE IV spaceflight mission. Utilizing solar occultation imaging, SAGE IV will be capable of measuring ozone, aerosol, and other trace gas species with the same quality as previous SAGE instruments but with greatly improved pointing knowledge. Furthermore, current technological advancements allow SAGE IV to fit within a CubeSat framework and make use of commercial hardware, significantly reducing the size and cost when compared with traditional missions and enabling sustainability of future measurements. SAGE IV will meet the definition of the newly-recommended Venture-Continuity missions by "bringing forward innovative approaches to sustain measurements at lower costs."

Key words: aerosols, CubeSat, innovation, occultation, ozone

References

² National Academies of Sciences, Engineering, and Medicine. 2018. *Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space*. Washington, DC: The National Academies Press.

³42 U.S.C. § 7671b(d)(2) (2018)