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Smaller average stratospheric aerosol sizes after volcanic eruptions in 2018 and 2019

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We present surprising results of our stratospheric aerosol size retrieval which is using the SAGE III/ISS solar occultation measurements, that started in 2017. Due to the broad wavelength spectrum covered by the instrument a robust retrieval of the median radius, mode width and number density of monomodal lognormal size distributions is possible.

In the timeframe of SAGE III's operation so far three small to mid intensity volcanic eruptions that reached and perturbed the stratospheric aerosol layer were observed by the instrument: The Ambae eruptions (15.3°S) in spring of 2018 and the Raikoke (48.3°N) and Ulawun (5.05°S) eruptions, both in June 2019. While the Raikoke eruption led to an increase in the median radius of the stratospheric aerosols, which was to be expected and is in line with previous observations, the Ambae and Ulawun eruption had a different effect. After both eruptions the average aerosol size decreased, with lower median radii and narrower size distributions, while the number density increased strongly. The observation, that volcanic eruptions may lead to smaller average stratospheric aerosol sizes is a novel one and should be of great interest to the modeling as well as remote sensing community.

We will present the temporal and spatial evolution of the stratospheric perturbations and discuss what may distinguish those three eruptions from each other.