(18-240328-A) **Stratospheric Aerosol Effective Radius Response to Volcanic and Wildfire Perturbations – Insight from the B²SAP Network**

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The stratospheric aerosol layer is a key component of the Earth system through its influence on the global radiation budget, stratospheric dynamics, and the ozone layer. A better understanding of the processes that control the formation, evolution, and fate of stratospheric aerosol and how the stratospheric aerosol layer responds to various perturbations will inform future decision-making regarding potential climate mitigation strategies. Specifically, the aerosol size distribution is one of the main factors affecting optical properties and chemical impacts. However, measurements that provide insight into stratospheric aerosol microphysics are challenging due to the high altitude and low pressure, which explains both the scarcity of the historical stratospheric aerosol record and why models have not yet come to a consensus regarding their aerosol parametrization in this atmospheric layer. This knowledge gap strongly motivates a program of systematic in-situ observations stratospheric aerosol size distributions.

Within the NOAA Earth's Radiation Budget (ERB) Initiative, the Baseline Balloon Stratospheric Aerosol Profiles (B²SAP) project aims at characterizing the global stratospheric aerosol number and size distribution. As of today, there are four regular B²SAP launch sites, chosen to cover a large latitudinal range: i) Boulder, CO, USA, (40°N), ii) Lauder, NZ, (45°S), iii) Hilo, HI, USA, (19°N), and iv) Reunion Island, FR, (21°S). The B²SAP network will continue to expand latitudinally in the future to include both deep tropical and high latitude observations, starting this Spring with Utqiagvik, AK, USA (71°N). B²SAP products, totalizing more than 120 flights, include vertical profiles from the surface to 28 km of meteorological data, ozone, and water vapor as well as size distribution and number concentration of aerosol. The effective radius of stratospheric aerosol can be derived from the measured size distribution, providing a useful metric for comparison with models and other sensors, such as SAGE-III/ISS. Certain events, such as volcanic activity or large biomass burning can perturb the size distribution of stratospheric aerosol. Here, we use a combination of B²SAP and model data to investigate the impacts various past events have had on the effective radius of the stratospheric aerosol layer. We will detail the differences between small to large volcanic injections (La Soufriere, Ulawan, Raikoke, Hunga) as well as the Australian wildfires of 2019-2020.

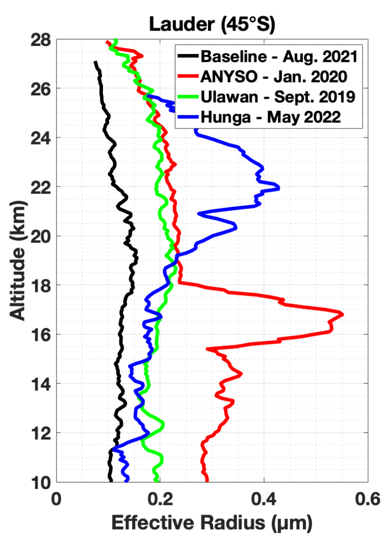

Figure 1. Profiles of effective radius of aerosol above Lauder, NZ following different stratopsheric perturbations.