

Balloonborne Measurements of Aerosol Size and Number Concentration in the mid Latitudes Spanning 30 Years in the North and 10 Years in the South

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Vertical profiles of aerosol particle size and number concentration have been measured above Laramie, Wyoming (41 N), approximately monthly since the early 1970s. The initial measurements included condensation nuclei and aerosol with radii > 0.15 and 0.25 micrometer. Larger sizes were added in the early 1980s, and have become a regular feature of the measurements since 1990. Yearly measurements were begun in 1991 from Lauder, New Zealand (45°S) with the newer instruments. These balloonborne in situ measurements have captured the major volcanic eruptions of Fuego (1974), El Chichón (1982), and Pinatubo (1991), as well as a number of smaller eruptions. They have also spanned three volcanically quiescent periods, the late 1970s, the late 1980s, and the present, which appears to have started in early 1997. Since 1997 aerosol surface area concentrations ($\mu\text{m}^2/\text{cm}^3$) have remained near 1-2 at 16 km and 0.5-1.0 at 22 km. Peak surface area concentrations were 10-20 times this after both El Chichón and Pinatubo. The decay of stratospheric aerosol was much less perturbed by small eruptions following Pinatubo than following El Chichón.

These measurements have been compared with satellite measurements of aerosol extinction from both SAGE (past 17 years) and HALOE (past 10 years). The agreement with the remotely sensed data is quite reasonable when extinction and aerosol volume are compared, but is a function of aerosol loading for aerosol surface area. Remote estimates of aerosol surface are less than the in situ estimates during periods of low aerosol loading.

The evolution of aerosol surface area, volume, and number concentration from the tropopause to 30 km over the past 30 years based on these balloonborne measurements will be presented.

Uncertainties associated with the measurements and comparisons with measurements from other platforms will be discussed.