NOTES FROM OBSERVATORIES

MOUNT PINATUBO AND ATMOSPHERIC EXTINCTION AT
MOUNT JOHN UNIVERSITY OBSERVATORY 1987-94

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A variety of photometric observing programmes undertaken at Mt. John University Observatory (MJUO) obtain atmospheric extinction data in several passbands. The atmospheric extinction in the V passband measured at MJUO from late 1987 to early 1994 is shown in Fig. 1. Every data point is the average extinction over each night observed and has been derived from one of several instrumental systems and reduction algorithms.

The first system is a Johnson V filter on either a Boller & Chivens or an Optical Craftsman 60cm telescope, with the extinction derived from a Bouguer plot using the programs of Henden and Kaitchuck. The mean wavelength of the response function of the Vilnius V filter nearly coincides with that of the Johnson V, allowing the V extinction between the two systems to be considered the same (to an first order approximation). A modified version of Nikonov’s method was used to measure the extinction once every hour during the night.

The third system is a Johnson filter set on the M’Lellan one metre telescope using a Thomson CCD with a Photometrics control system. The extinction was calculated from observations of standard stars over a wide range of airmass, simultaneously fitting the standardisation transformation and extinction coefficients as described by Harris et al. and implemented in the Image Analysis and Reduction Facility (IRAF).

The final system is a two channel photomultiplier instrument on the one metre telescope using a Johnson V filter. The extinction data were derived from custom written software based on a Bouguer plot. The extinction values found by the different systems were compared for common nights and agree within 0.03 mags/airmass. As another check, the
average extinction values (before and after the Mt. Pinatubo eruption) of each system were calculated and again all found to agree within 0.03 mags/airmass.

The effect of the 15 June 1991 Mt. Pinatubo eruption can clearly be seen in Fig. 1, with the dashed lines representing the average extinction before and after the eruption. This was the only volcanic event during the period 1987-94 to have a significant effect on the stratosphere. The increase in average V extinction (0.08 mags/airmass) in similar to that found at La Silla (0.078 mags/airmass), SAAO (0.06 mags/airmass) and Kitt Peak (0.08 mags/airmass).

It took approximately 80 days for the aerosol cloud to reach New Zealand, with the extinction starting to increase around JD 2448500, and reaching an initial maximum about 1 October 1991 (JD 2448530). As of June 1994, the extinction has not yet returned to pre-eruption levels. Further, the night-to-night variations hide any exponential decay back towards the Mt. Pinatubo pre-eruption levels, as also found at La Silla.

The data were also investigated for seasonal effects, as there appeared to be an increase in the extinction every July since the eruption. A sinusoid was fitted, but was not found to be statistically more significant than a single (mean) extinction value. Hence the night-to-night variations in extinction are greater than any seasonal changes, emphasizing that extinction should be determined for each night rather than using monthly averages.
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Extinction at Mt. John from 1987–94

Legend
- PMT, Johnson
- PMT, Vilnius
- CCD, Johnson
- 2 channel, Johnson