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## Improved mid-infrared cross-sections for peroxyacetyl nitrate (PAN) vapour

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**Abstract.** Absorption spectra of peroxyacetyl nitrate (PAN, CH<sub>3</sub>C(O)OONO<sub>2</sub>) vapour at room temperature (295K) have been measured in the mid-infrared range, 550-2200cm<sup>-1</sup> (18.2-4.55µm), using a Fourier Transform infrared spectrometer at instrument resolutions of 0.25 and 0.03cm<sup>-1</sup> (unapodised). Between five and eight measurements were obtained for each spectral band of PAN in the pressure range 0.24-2.20mb showing good agreement with Beer's law. Both cross-section data and integrated absorption intensities for the five principal bands in the PAN spectra in this spectral range have been derived with peak cross-sections of the 794, 1163, 1302, 1741 and 1842cm<sup>-1</sup> bands measured to be 0.95(±0.02), 1.21(±0.03), 0.92(±0.02), 2.39(±0.06) and 0.74(±0.03) (x10<sup>-18</sup>cm<sup>2</sup>molecule<sup>-1</sup>) respectively. Band intensities and band centre absorptivities are also reported for four weaker PAN absorption bands in the mid infrared for the first time. These observations are the highest spectral resolution measurements of PAN bands reported in the infrared to date. For three of the five strongest bands, the absolute integrated absorption intensities are in excellent agreement with previous studies. A 4.8% lower integrated intensity was found for the 1741cm<sup>-1</sup>v<sub>as</sub>(NO<sub>2</sub>) PAN absorption band, possibly as a result of the removal in this work of spectra affected by acetone contamination, while a 10.6% higher intensity was determined for the 1163cm<sup>-1</sup>v(C-O) absorption band. No resolution of fine structure in the PAN absorption bands was observed at the resolutions studied. The confirmation of absorption cross-sections and estimated errors in this work will allow more accurate investigations of PAN using infrared spectroscopy, particularly for remote sensing of PAN in the atmosphere.

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