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Venus transit 2004: Illustrating the capability of exoplanet transmission spectroscopy

P. Hedelt, R. Alonso, T. Brown, M. Collados Vera, H. Rauer, H. Schleicher, W. Schmidt, F. Schreier, R. Titz

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The transit of Venus in 2004 offered the rare possibility to remotely sense a well-known planetary atmosphere using ground-based observations for absorption spectroscopy. Transmission spectra of Venus' atmosphere were obtained in the near infrared using the Vacuum Tower Telescope (VTT) in Tenerife. Since the instrument was designed to measure the very bright photosphere of the Sun, extracting Venus' atmosphere was challenging. CO_2 absorption lines could be identified in the upper Venus atmosphere. Moreover, the relative abundance of the three most abundant CO_2 isotopologues could be determined. The observations resolved Venus' limb, showing Doppler-shifted absorption lines that are probably caused by high-altitude winds.

This paper illustrates the ability of ground-based measurements to examine atmospheric constituents of a terrestrial planet atmosphere which might be applied in future to terrestrial extrasolar planets.

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