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Near-infrared Ground-based Observations Of Venus: Technique And Observations Of H₂O Variations In The Lower Atmosphere.

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Ground-based spatially resolved near-infrared spectroscopic observations of the Venusian night-side have been obtained prior or post inferior conjunctions in September 2002, July 2004 and December 2005. Observations have been made using IRIS2 on the Anglo-Australian Telescope and CASPIR on the 2.3m ANU Telescope. We are analysing this data to obtain temporal variations, gradients and spatial distributions of H₂O in the Venusian lower atmosphere.

Thermal emission can be observed through near infrared atmospheric windows discovered in 1984. Windows at 1.74 μm and 2.3 μm probe just below the base of the clouds, whereas near infrared windows short-ward of 1.31 μm show radiation from the lowest 25 km of the atmosphere with an increasing fraction of the emission originating from the surface.

Images obtained at 1.31 μm are dominated by contrasts due to cloud opacities and these contrasts are present at similar strengths in images obtained at 1.18 μm . However at the shorter wavelength, contrasts due to surface features are stronger. By ratioing these images, features corresponding to the overlying clouds can be removed, revealing the surface topography of Venus (Meadows, PhD thesis, 1994).

By using water vapour absorption lines in the 1.18 μm atmospheric window and comparing paths over topography of different heights it is possible to study the water vapour content of the lower atmosphere (Meadows and Crisp 1996). New instruments such as IRIS2 have provided a substantial improvement in the spectral and spatial resolutions that can be used for such studies.

The European Space Agency Venus Express mission has based much of their science on the infrared techniques discussed. Our long term ground-based data on the properties of the Venusian near surface environment will help to provide a scientific context for the Venus Express results.

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