

## Winds in Venus' Lower Mesosphere

Thomas Widemann, Emmanuel Lellouch

*LESIA, Observatoire de Paris-Meudon, 92195 Meudon, France*

Dynamics of Venus' mesosphere (70-110 km) is characterized by the coexistence of two different wind regimes : (1) between 70 and 85 km the vertical amplitude decrease of Venus' zonal retrograde super-rotation ; (2) between 85 and 110 km, a stable, sub-solar to anti-solar (SSAS) flow, driven by solar EUV heating. On July 7-14, 2001 and July 31 - August 4, 2002 we observed Venus with the Aurélie spectrometer on the 1.5-m telescope at Observatoire de Haute-Provence, France. The spectra cover the visible 8660-8730 Å range, in the  $5\nu_3$  band of  $^{12}\text{C}^{16}\text{O}_2$ , at a resolving power of about 120,000. Seven regions were observed on Venus' illuminated side at  $\sim 75^\circ$  phase angle. About 28 lines from the P and R branches of the  $5\nu_3$  band were detected and used for wind velocity measurements with an accuracy of 15 to 25  $\text{ms}^{-1}$ .

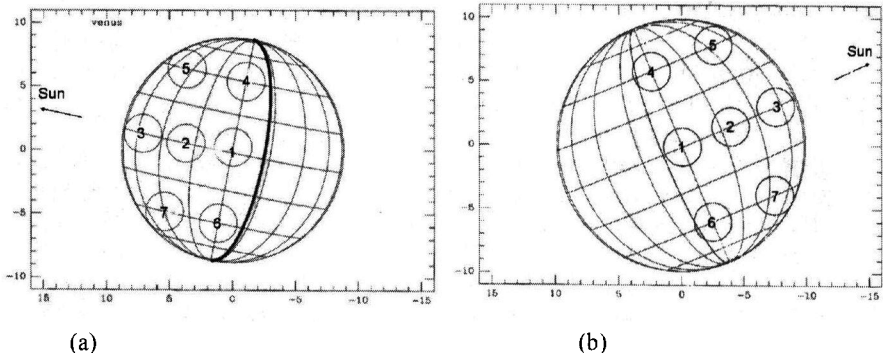


Figure 1. Field mapping of wind velocity field on Venus in the  $\text{CO}_2$   $5\nu_3$  visible band near 8700 Å near maximum elongation in 2001 (a) and 2002 (b). The 120,000-resolution Haute-Provence spectrograph has a 3" entrance aperture, projected on a disk size of 18-20 arcsec.

Using zero-wind reference at disk center and drift,  $\text{CO}_2$  and solar lines velocity is de-projected from line-of-sight into one purely zonal, or a combination of zonal and SSAS circulations. Those measurements probe visible absorption lines of  $\text{CO}_2$  in an altitude range at two scale heights above cloud top. Results show circulation is mainly zonal. This analysis was applied to most reliable observations at both planetary elongations. De-projection shows a mainly zonal velocity but highly variable with an important relative error ( $70 \pm 60 \text{ ms}^{-1}$  in 2001,  $170 \pm 130 \text{ ms}^{-1}$  in 2002). The expected return branch of upper mesospheric circulation, anti-solar to solar, is detected in our observations at an amplitude of  $-45 \pm 30 \text{ ms}^{-1}$ .