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Venus night side measurements of winds at 115 km altitude from NO bright patches tracking.

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N and O atoms produced by photo-dissociation of CO_2 and N2 on the day side of Venus are transported to the night side in the thermospheric circulation. When the air parcel is descending, the recombination N+O$\rightarrow$ NO produces the famous γ and δ bands of NO emission. Pioneer Venus (1978) suggested that the statistical center of the emission is off from the anti-solar point, about one- two hours in Local time after midnight. This is confirmed from SPICAV/VEX results, and the explanation generally accepted is the influence of retrograde super rotation. However, the emission takes place at 115 km, while VIRTIS/VEX, with maps of O_2 emission (peak altitude 95 km) in the night side of Venus (recombination of O+O coming from the day side), has shown that the maximum of emission is statistically centered on the antisolar point. Therefore, there is no influence of super-rotation at 95 km. One way to explain this paradox is that the cause of the super rotation is different at 115 km and in the lower atmosphere. Alternately, some gravity waves could propagate from below, crossing the altitude 95 km with minimal interaction, and breaking around 115 km, depositing their momentum.
Another consideration is that the altitude of N2 photo-dissociation is higher in the thermosphere than CO_2, therefore the thermospheric circulation pattern may be different for the transport of N atoms, and O atoms.
We have started building maps of the NO emission by moving around the spacecraft along its orbit on the night side. The idea is that NO emission is concentrated generally in rather well defined patches of light. Therefore, by comparing maps taken at 1 hour or 24 hr interval, we can make a “bright patch tracking”, and derive directly the velocity of the moving air parcel containing N and O (we are aware that a part of the motion could be due to a phase shift of a gravity wave, if it has some influence on the NO emission).
Preliminary results from this exercise with Venus Express will be presented and discussed.