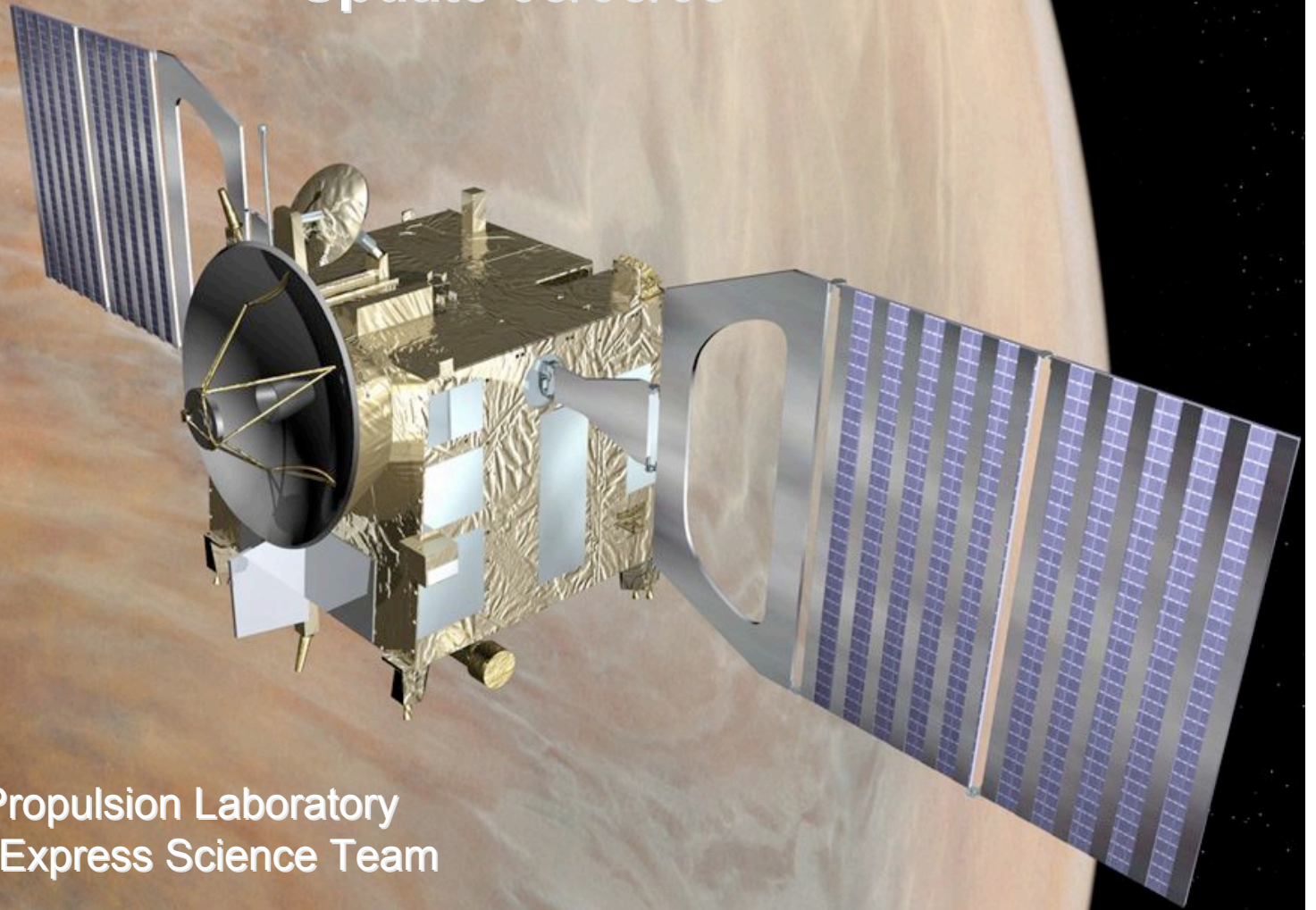


VENUS EXPRESS
Recent Results from NASA Participating
Scientists and IDS's
Update 05/08/08



Kevin Baines, Jet Propulsion Laboratory
Leader, US Venus Express Science Team

JGR Special Issue

Volume I

Titov, Dmitri	Introduction																		
Svedhem, Hakan	Venus Express overview																		
Section 2. Composition																			
Marcq, Emmanuel	A latitudinal survey of CO, OCS, H ₂ O and SO ₂ in the lower atmosphere of Venus: spectroscopic studies using VIRTIS-H																		
Tsang, Constantine Chak Chuen	Tropospheric Carbon Monoxide Concentrations and Variability on Venus from Venus Express/VIRTIS-M Observations																		
Irwin, Patrick Gerard	Spatial variability of carbon monoxide in Venus' mesosphere from Venus Express/VIRTIS measurements																		
Vandaele, Ann-Carine	Atmospheric composition of Venus measured by SOIR																		
Fedorova, Anna	HDO and H ₂ O vertical distribution																		
Belyaev, Denis	SO ₂ in the mesosphere																		
Yung, Yuk L.	Modeling the Distribution of OCS in the Lower Atmosphere of Venus																		
Liang, Mao-Chang	Modeling the Distribution of H₂O and HDO in the Upper Atmosphere of Venus																		
Section 4. Atmospheric dynamics																			
Moissl, Richard	Cloud top winds from tracking UV features in VMC Images																		
Piccialli, Arianna	Cyclostrophic winds																		
Garcia, Raphael	Gravity waves in Venus upper atmosphere revealed by CO ₂ Non Local Thermodynamic Equilibrium emissions																		
Marcq, Emmanuel	Simulations of the latitudinal variations of CO and OCS below the clouds of Venus using a General Circulation Model																		
McGouldrick, Kevin	Venus Express / VIRTIS Observations of Middle and Lower Cloud Variability, and Implications for Dynamics																		
Russell	Whistler-mode signals from lightning																		
Section 5. Non-LTE emissions																			
Hueso, Ricardo	Morphology and Dynamics of Venus Oxygen Airglow from Venus Express/VIRTIS observations																		
Gilli, Gabriella	Limb observations of CO ₂ and CO non-LTE emissions in the Venus atmosphere by VIRTIS/Venus Express																		
Piccioni, Giuseppe	Venus oxigen airglow																		
Gerard, Jean-Claude	Limb observations of the ultraviolet nitric oxide nightglow with SPICAV on board Venus Express																		
Section 7. Surface observations																			
Mueller, Nils Tobias	Venus surface thermal emission at one micrometer in VIRTIS imaging observations - evidence for variation of crust and mantle differentiation conditions																		
Basilevsky, Alexander	VMC images of the surface																		
Arnold, Gabriele	Venus surface data extraction from VIRTIS/VEX measurements. Part I: Estimation of a quantitative approach																		
Hashimoto, George	Galileo/NIMS																		

JGR Special Issue

Volume II

Grinspoon, David	Current climate and evolution of Venus								
Section 1. Structure of the atmosphere									
Grassi, Davide	Retrieval of Air Temperature Profiles in the Venusian Mesosphere from VIRTIS-M data: Description and Validation of Algorithms								
S. Tellmann	Temperature structure from VERA								
Section 3. Clouds and Hazes									
Wilson, Colin F	Evidence for anomalous cloud particles at the poles of Venus								
Erard, Stephane	Multivariate analysis of Virtis/Venus-Express night side and limb observations								
N. Ignatiev	Altimetry of the Venus cloud tops								
D. Titov	Synergy of the UV and IR views								
R. Carlson	Venus UV absorber								
R. Carlson	Continuum opacity of CO2								
T. Satoh	Venus clouds from the Venus Express observations								
V. Wilquet	Characterization of the upper haze from SPICAV								
Section 6. Plasma environment									
Luhmann, Janet G	Venus Express Observations of Atmospheric Oxygen Escape During the Passage of Several Coronal Mass Ejections								
Galli, Andre	The Tailward Flow of Energetic Neutral Atoms Observed at Venus								
T. Zhang	Solar wind interaction								
M. Delva	Ion cyclotron waves								
M. Gedalin	Ion thermalization in low Mach kinematic shocks								
Volwerk	Mirror mode waves								
M. Paetzold	Structure of the ionosphere								
M. Paetzold	Meteor layers in the Venus ionosphere								
K. Szego	On the ion mantle of Venus								
Martinecz	The plasma environment of venus								
Coates	Ionospheric photoelectrons								
Voeroes	Venussian wake turbulence								
Fedorov	Fine structure of the interference btw solar wind and induced magnetosphere								
Zhang	Unusually distant bow shock								
Verigin	Venus ionopause solar cycle variations								
Late papers									
Simpson	Surface studies by bi-static radar								



**Chemical Sources and Sinks of OCS
in the Lower Atmosphere of Venus**

**Yuk L. Yung
M. C. Liang,**

California Institute of Technology

yly@gps.caltech.edu

EGU Meeting

2008

HIGHLIGHTS

- Photosensitized dissociation of OCS via polysulfur photochemistry provides additional loss of OCS
- Total source of OCS is 23,000 Tg- S/yr [Earth = 10 Tg- S/yr]; if volcanic, it implies ~1,000 times volcanic activities on Earth
- Yung, Y. L., M. C. Liang, X. Jiang, C. Lee, B. Bezdard and E. Marcq. (2008). “Modeling the Distribution of OCS in the Lower Atmosphere of Venus”, *J. Geophys. Res.*, Submitted

Modeling the Distribution of H₂O and HDO in the upper atmosphere of Venus

Mao-Chang Liang

Research Center for Environmental Changes, Academia Sinica

Y. L. Yung (Caltech)

Highlights

- The increase ratio of HDO/H₂O in the upper atmosphere of Venus is most likely caused by the photolysis of water.
- The inferred transport time in this part of the atmosphere can not be shorter than the lifetime of water which is significantly greater than 10⁶ sec, likely to be as long as 300 years



Observation of the Distribution, Morphology, and Evolution of Holes in the Venus Clouds with VIRTIS

K. McGouldrick¹, K. H. Baines²,
D. H. Grinspoon¹, and T. W. Momary²

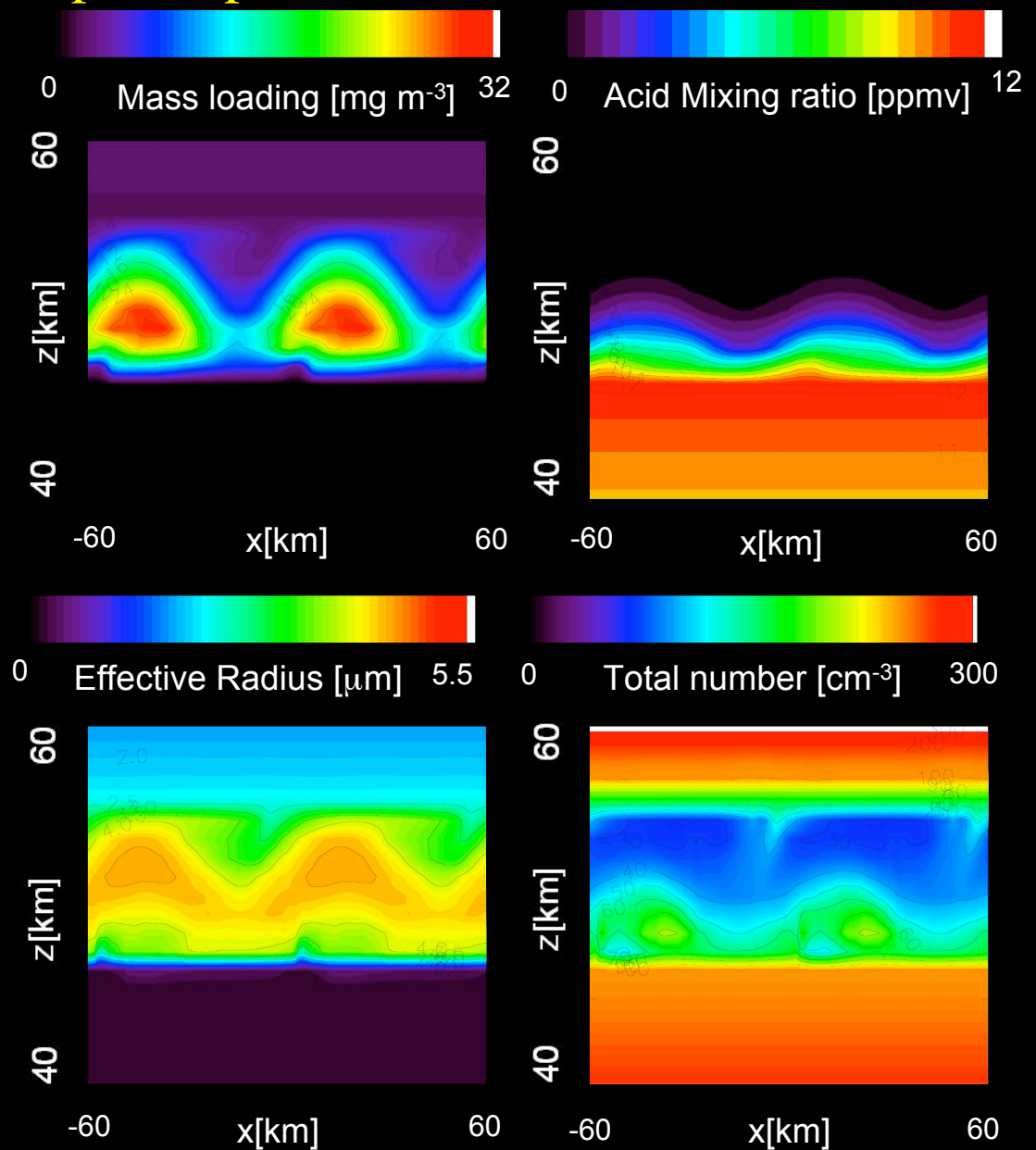
¹Denver Museum of Nature & Science

²Jet Propulsion Laboratory

Venus Express Science Workshop
La Thuile, Valle d'Aosta, Italy
5 March 2008

The mass loading, acid vapor mixing ratio, particle number and effective radius respond to the imposed pseudo-convective winds.

- Increases in mass loading and sulfuric acid vapor mixing ratio in regions of updraft
- Similarly, decreases in regions of downdraft.
- Effective radius behavior not as simple
 - Increases at higher altitudes; but decreases at lower altitudes in updraft.
 - This is due to growth versus activation processes.
- This work recently accepted for publication in PSS



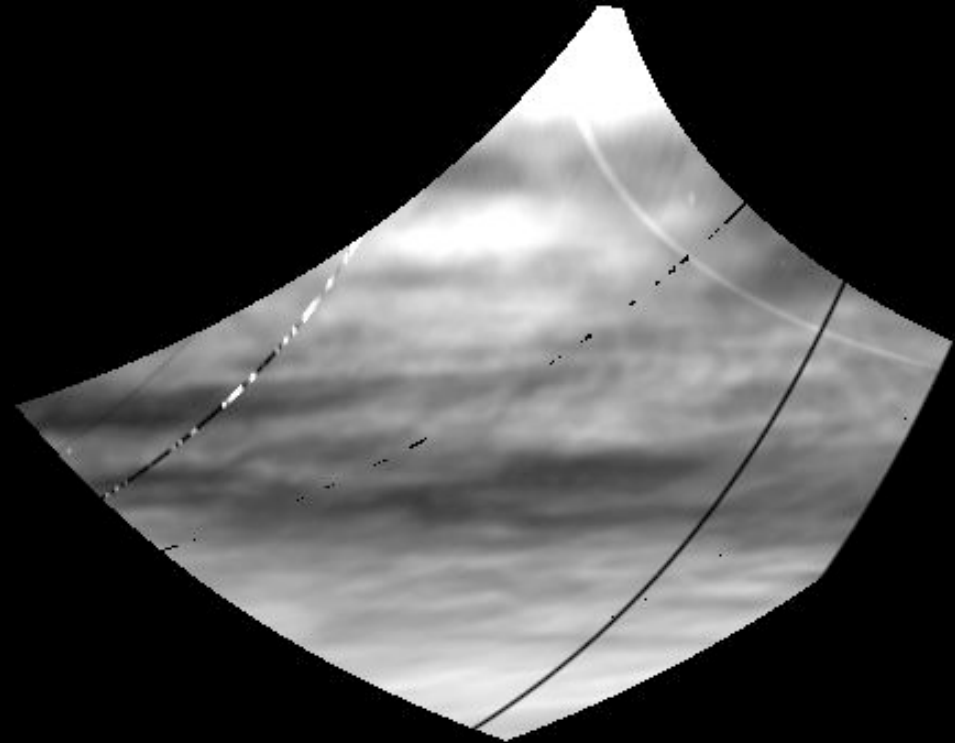
Goals of analysis of observations



- Mean radiance as a function of latitude
- Morphology of features
 - Aspect ratio
 - Angle relative to zonal
 - Morphology as a function of latitude
- Evolution of features with time
 - Change in size with time?
 - Change in total radiance in hole with time?
 - Statistical analysis of features as function of size?

Cloud/Hole Evolution

- Have series of 11 images in a single orbit (5 hours of observation)
- Identify small (~100 km) holes and determine their typical lifetimes



Click image for javascript movie of cloud evolution and motion
Alternately, here is [5.5 day period](#) and [6.5 day period](#)

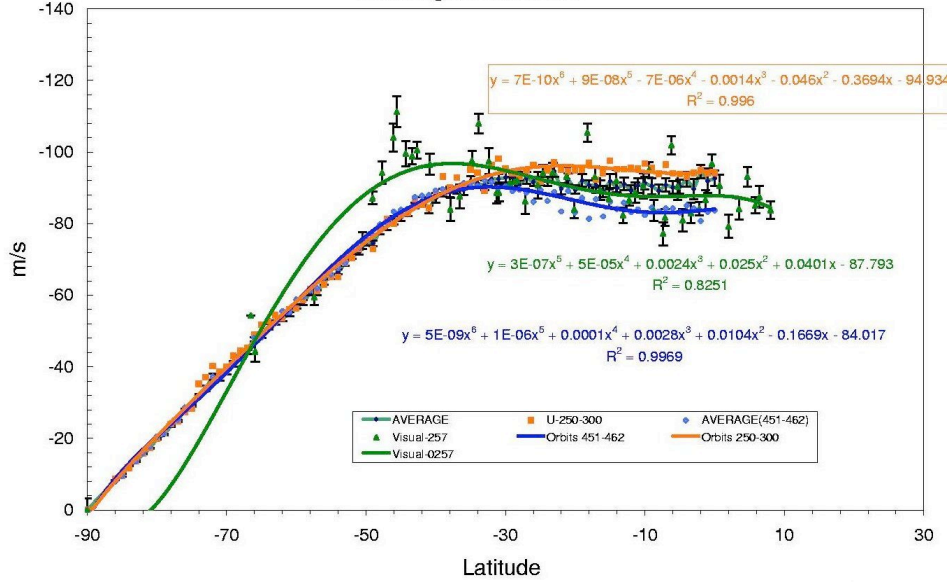
Conclusions and Future Work

- Considerable variability of brightness at latitudes equatorward of 60° .
- Morphology of holes consistent with previous observations made nearly 20 years ago.
- Total integrated radiance of a hole is the most significant arbiter of its evolution.
- Middle and lower cloud deck, especially at lower latitudes, is very dynamically active.

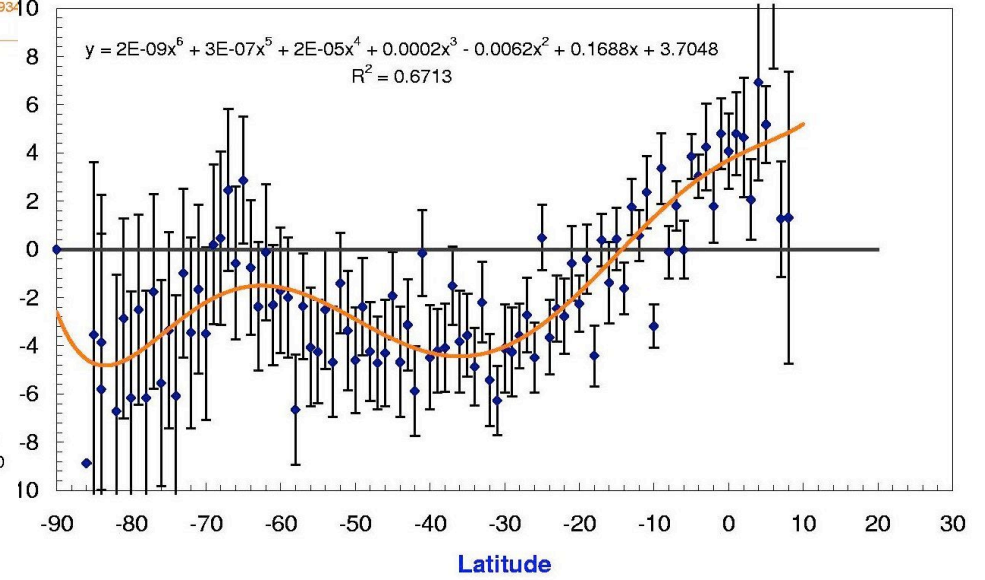
Sanjay Limaye, University of Wisconsin-Madison
Goal: Understanding the Superrotation of the Venus
Atmosphere

- Observe the global circulation of the atmosphere of Venus at the UV cloud level from VMC images
- Look for temporal variability
- Look for planetary waves
- Look for thermal tides in zonal and meridional component

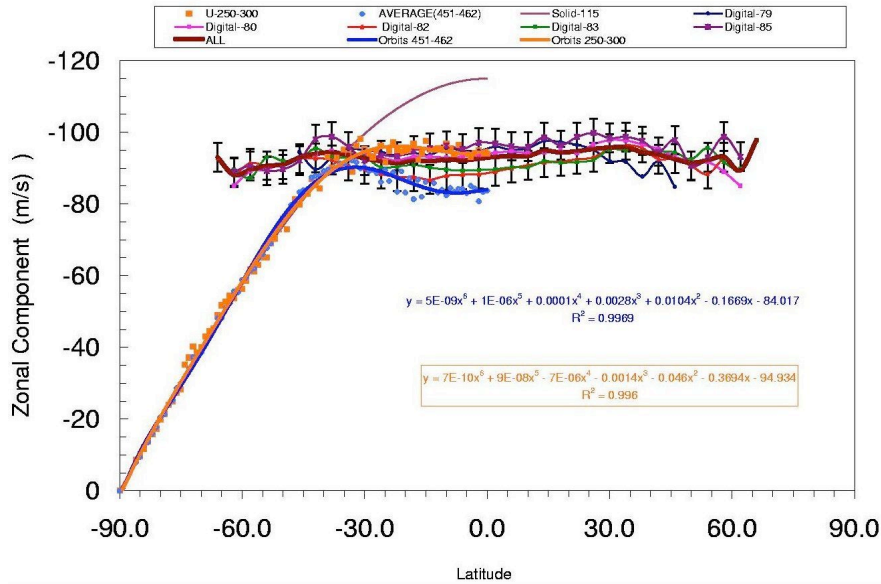
Comparison of Digital Average Zonal Flow Over Orbits 30-462 and Visual Tracking for Orbit 257



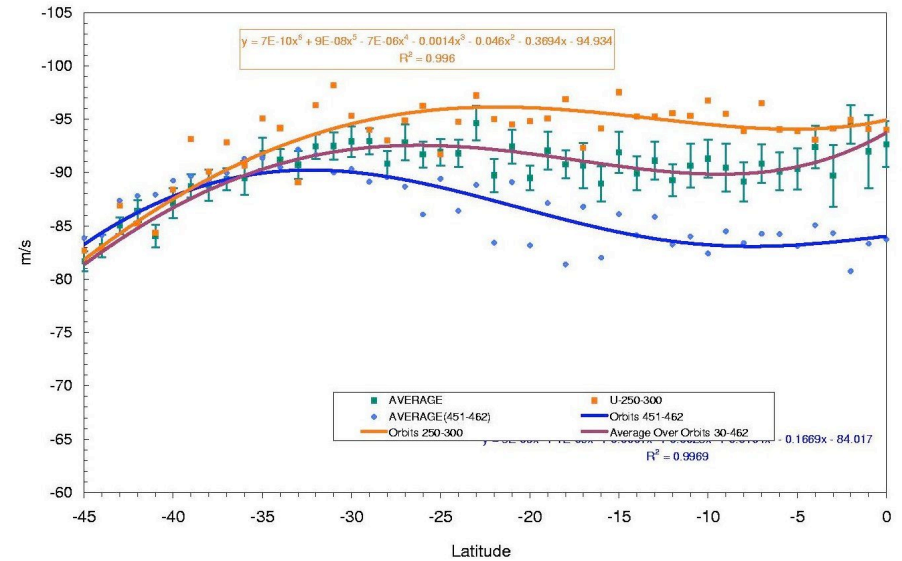
Average Dayside Meridional Flow - 30 orbits between #s 30 and 462



Comparison with Pioneer Venus Digital Tracking (Rossow et al. (1990))



Variation of Dayside Average Zonal Flow Over Orbits 30-462



Summary

- VMC Image Resolution is limiting for results so far
 - Need to track ~ 10 km/pixel instead of ~ 40 km/pixel
 - New observing sequences using pendulum pointing is providing such data
- Digital Tracking and Visual Tracking consistent within respective uncertainties between equator and ~ 45 degrees latitude
- Poleward of ~ 45 degrees the Visual and Digital Tracking differ by ~ 10 m/s. Analysis continuing
- Long term changes (3 to 6 months) are indicated
- Local Time dependence detected. Analysis continuing of the digital tracking results
- *Paper on vortex circulation “ready” to be submitted to Nature*

***Frontiers in radiative transfer for
remote sensing and climate modeling
of Venus***

David Crisp (JPL/Caltech)

April 2008

Conclusions

- While recent advances in radiative transfer modeling methods and databases have improved our remote sensing and climate models, we have highlighted the need for additional work in:
 - Absorption line databases for key gases (CO₂, H₂O, O₃, O₂ and H₂)
 - Absorption line shape
 - Line mixing
 - Pressure induced absorption
 - Non-LTE processes (especially at NIR wavelengths)
 - Scattering properties of airborne dust and ice
 - Surface scattering properties