

**DENVER MUSEUM OF NATURE AND SCIENCE**  
**VENUS WINDS PROJECT**  
**MINUTES OF MEETING**

Date/Time/Location: 24 April 2014 6:00-8:00 PM Admin 2

**ATTENDING**

<b>Bullock</b>	<b>Doubek</b>	Harter	Knutson	<b>Lindsay</b>	Rabellino
Romero	<b>Tarr</b>				

Guests: **Emilie Royer**

**OLD BUSINESS**

**Results of assignments to determine wind speed examples**

7 Jul 2004	Marta	
8 Jul 2004	Bryan	
9 Jul 2004	Michael D.	Images centered and transformed to cylindrical projection
10 Jul 2004	Marta	
11 Jul 2004	Art	Completed
12 Jul 2004	Carlos	
13 Jul 2004	Mark	Completed

*Art reported on the completion of his assignment of 11 Jul 2004. He chose five images over four intervals, with roughly the same elapsed time between them: numbers 0050; 0930; 1700; 2400; and 3244. These images were transformed into cylindrically projected images and, in each of them, he chose 15 clearly identifiable features, in both bright and dark patterns. He entered these data into Mark's spreadsheet which calculates the geographical latitude and longitude coordinates for these features. The data were displayed graphically to show the variation of zonal (E/W) and meridional (N/S) components of average velocity  $U(m/s)$  and  $V(m/s)$ .*

*Over the longest interval (images 0050 to 3244),  $U(m/s)$  is relatively smooth for most points while  $V(m/s)$  shows a more erratic profile. At the shortest intervals, even  $U(m/s)$  becomes erratic.*

*Michael displayed two centered images from 9 Jul 2004. Mark transformed those images into cylindrically projected ones so that Michael can determine the mean zonal and meridional components.*

**Venus Winds wiki improvements** Mark  
*Postponed.*

**Proposed manuscript for publication** Mark

*Mark presented an outline of a manuscript proposed for publication in a scholarly journal. The content will report results of our determination of zonal and meridional components of Venusian cloud features observed on infrared images.*

**Investigate some images on JPL web sites**                      Mark  
*Postponed.*

**Previous Venus wind speeds from other scientists**                      Mark  
*Mark distributed copies of two studies that report wind velocities in the atmosphere of Venus derived from ground-based observatories (Crisp and others, 1991) and the VIRTIS instrument on Venus Express (Sanchez-Lavega and others, 2008). Both studies contain wind profile components, zonal velocity  $U$ (m/s) and meridional velocity  $V$ (m/s), as a function of latitude. The methodology used in both studies is similar to our assignments.*

**Mathematics of the rectangular coordinates transformation**                      Mark, Art  
*Postponed.*

### ***NEW BUSINESS***

**Sources of errors in velocity determination**  
*An extended discussion identified at least three sources of errors in determination of velocity components: a) co-registration of (several to many) successive images using the same mask; b) observer errors in accurately locating the same cloud feature in successive images; and c) evolving changes in cloud morphology.*

**Crowd-sourcing**  
*A free-wheeling discussion centered on innovative methods to get significant numbers of observations of the coordinates of cloud features. One idea was crowd-sourcing, to open the measurements to Museum visitors who would be instructed (by a short video, say) in identifying the location of a cloud feature at a kiosk. The aggregate of choices for a specific feature would be computed in real time and displayed for feedback.*

The next meeting on May 8 will be in the usual space, Admin 2.

Submitted by Arthur C. Tarr, Venus Winds Project Coordinator