

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

Date/Time/Location: 24 May 2016 6:00 PM Studio 106

**ATTENDING**

<b>Art</b>	Ashley	Christian	<b>Connor</b>	Cristy	<b>Dave</b>	Drew
Dylan	Elizabeth	Emilie	John	Kevin	<b>Mark</b>	<b>Marta</b>
Michael D.	<b>Michael L.</b>	Rachel	Terran	<b>Yvonne</b>		

Guests: **Barath Gopal (bg)**

The meeting opened at 6:00 PM in Studio 106. Those **attending** are listed above. **Barath Gopal** (he prefers **bg**), a new Museum Volunteer, checked us out!

**OLD BUSINESS**

**Image Processing Results–All**

Everyone now has an assignment and thumb-drive to copy results. We looked at new results from Art, Yvonne, and Connor. In addition to removing the spectrometer slit from his images, Art cleaned up most of the blemishes and bad pixels in his images. He noted that this wasn't terribly time-consuming in Photoshop. Yvonne was also able to successfully remove the spectrometer slit in her images. Connor worked on centering his images, and found a method in GIMP to do auto-centering within a prescribed mask – in our case, a black square with a circular hole cut in it, the size of the Venus disk. Connor will continue to investigate the accuracy of this technique using masks of different sizes. These commands probably exist in Photoshop as well, so Mark will look into that. All these new results have been uploaded to the data server. Below is an example of one of Art's images with blemishes removed



### **Akatsuki Update – Mark**

Kevin and Mark are busy preparing for their meeting in Japan, May 30-31, with the Japanese Akatsuki scientists. While Kevin will stay there for a few months, Mark hopes to bring good news about the mission and plans for us to be able to work with the new images some time in the future. Only a handful of the thousands of images that have been acquired have been released to the science team and public. We hope to learn more about the release schedule to report at the next Venus Winds meeting.

### **Science on a Sphere –Michael and Connor**

Michael and Connor displayed a few variations of cloud opacity over the Magellan global mosaic, in order for us to assess the best opacity to display clouds on Science on a Sphere. They showed us Marta's recent movie clip of the Dec 18, 2010 images.

### **Image Processing Flow Diagram – Mark**

Mark showed the latest version of our process flow diagram, including embedded links to preliminary documentation and results.

### **Dealing with Rotated Raw Images – Mark**

Mark showed how to retrieve the image rotation angle from the image header. The parameter is called POSANGLE. This can then be used to re-align the image so that North is pointed up. Just rotate the raw image by the negative of POSANGLE. Only a small fraction of the images are rotated with respect with North, but they have to be corrected after the spectrometer slit and bad pixels have been removed, but before centering the images.

### **Bad Pixel Removal – Mark**

Mark demonstrated the steps needed to remove bad pixels from the Venus raw images using open source software by Meade, the telescope maker, called *Autostar Suite*. It is available for Windows and Macs, and Mark. The link to the software is on the project web site or <http://www.meade.com/support/software-firmware/>

### **JPL HORIZONS Ephemeris – Mark**

Mark demonstrated the use of the JPL ephemeris to obtain various Venus parameters that we need to process the images. These include the apparent size and phase of Venus at the time of observations, as well as sub-solar and sub-earth latitudes and longitudes and the position of Venus' north pole. Although we've introduced the HORIZONS ephemeris before, a quick refresher is necessary as we move to the more complex processing steps that involve these parameters. There's a link to the ephemeris on the project web page, or just go to: <http://ssd.jpl.nasa.gov/horizons.cgi>

## **POSTPONED**

### **Reading Assignment – Mark**

Mark will go over some of the most important points in *The New Solar System* chapter that relate to our project. Bring questions, as this chapter discusses the basic physics of planetary atmospheres.

## **NEW BUSINESS**

None.

The next meeting will be on 7 June 2016 at 6 PM. Studio 102

Submitted by Arthur C. Tarr, Venus Winds Project Coordinator