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Digital amateur observations of Venus at ~0.9μm

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Abstract

Venus atmosphere is extremely dynamic, though it is very difficult to observe any features on it in the visible and even in the near-IR range.

Digital observations with planetary cameras in recent years routinely produce high-quality images, especially in the near-infrared (0.7-1μm), since IR wavelengths are less influenced by Earth's atmosphere and Venus's atmosphere is partially transparent in this spectral region.

Continuous observations over a few hours may track dark atmospheric features in the dayside and determine their motion. In this work we will present such observations and some dark-feature motion measurements at ~0.9μm.

Ground-based observations at this wavelength are rare and are complementary to *in situ* observations by JAXA's Akatsuki orbiter, that studies the atmospheric dynamics of Venus also in this band with the IR1 camera [1,2].

1. Introduction

The dayside 0.90 μm images visualize the distribution of clouds illuminated by sunlight. Any features captured are considered to originate in the middle and lower cloud layers [3]. But, as with the visual band, the dayside disk appears almost featureless at this wavelength. Ground-based observations at this wavelength are very rare and moreover there are no image pairs to make measurements of the feature motion. Observations are very useful especially now that spacecraft Akatsuki is in orbit and takes images at this band with the onboard IR1 camera [4]. In this work we will briefly review the near-IR ~0.9μm imaging methodology, the observational results and some wind measurements.

2. Methodology

All observations were obtained with a 0.35m telescope and a DMK21AU618 camera along the 2016-7 eastern elongation of Venus. A Hutech IDAS 884-900nm bandpass filter was used. The observing method is based on image pairs or triplets separated by a temporal interval of ~1-2 hours [5]. Since observations were obtained from one observer, in order to achieve the typical observing window of ~2 hr with Venus in higher altitude we used Digital Daylight Observation (DDO) methodology [6] to capture the planet with the Sun above the horizon. When Venus is low in the horizon it is impossible to capture any useful details. Near-IR observations provide better resolution (suffers less from earth's atmospheric disturbance) and are less influenced by daylight radiation. Furthermore, it's quite hard to detect any low-contrast features in the bright Venus disk without special processing by using software like *Registax* and *Photoshop*.

3. Observations & Results

Some set of observations will be presented like the one in Fig.1.The complete set of observations can be found at [7]. The ~0.9μm images obtained were used for cloud tracking. *WinJupos* [8] was used to retrieve the velocity of individual features in different latitudes.

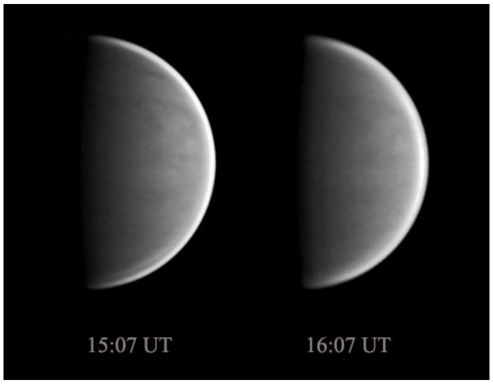

Figure 1. *Venus observations separated by one hour on Jan. 2nd, 2017 at 0.9μm showing movement of dark features [North is up]*

4. Summary and Conclusions

Modern technology and equipment allow planetary observations by amateurs in the ~0.9μm band. We presented the methodology, some observations and preliminary results that may be useful. Our data provide the first wind measurements in 0.9μm from a single ground-based observer.

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