

# Ground-based Observations of Venus in the Ultraviolet and Infrared Light

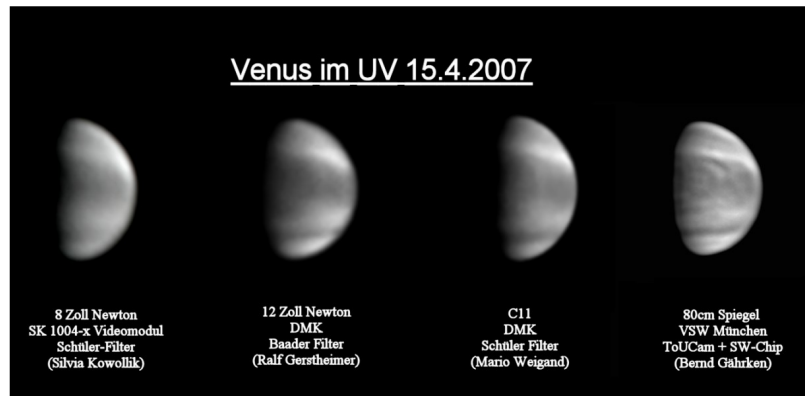
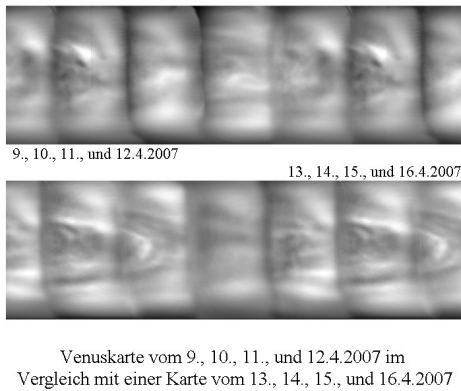
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Parallel to the Venus Express mission, ESA has initiated an observing campaign that incorporates a number of professional and amateur observers [1]. Since the cameras onboard Venus Express have only a small field of view, ground based observations can provide important context information on Venus's dense atmosphere as a whole. Permanent observations by professional and amateur telescopes are therefore useful, e.g., to monitor daily changes occurring in the very dynamic upper part of the Venusian atmosphere [2].

Typically, apertures of amateur telescopes vary between 8 and 16 inches, but occasionally Newton- and Cassegrain-type telescopes with apertures from 24 up to even 47 inches are in use at large public observatories. During the last couple of years, engaged amateur astronomers have benefited from the rapid development in the field of video-astronomy [3]. By selecting and adding thousands of only shortly-exposed video-frames, it is possible to freeze atmospheric turbulence, thereby circumventing problems commonly attributed to devastating atmospheric seeing conditions. With that method of "Lucky Imaging", it is possible to nearly achieve the theoretical limit of telescopic resolution. Furthermore, cheaper and more efficient UV-filters in association with increasingly sensitive optical systems put amateur astronomers in a position to resolve weak atmospheric details better than one arc second in apparent diameter. The most preferred UV-filter, made by the manufacturer Schueller/USA, has a distinct transmission window between a wavelength of 330 and 400 nm. We present images that show typical V- and Y-shaped structures of the Venusian atmosphere that are generally attributed to an unknown UV-absorber; some images also reveal white and dark streaks and bright polar regions [3]. First observations using a RG1000 filter have been performed in the infrared spectral range. Preliminary analyses suggest that structures visible in the infrared have an extremely weak contrast and appear to be much smaller than those seen in ultraviolet light.

Several observers in Germany are engaged in the Planetary Section of the Association of Amateur Astronomers (VdS) [4]. A number of those have gained considerable experience in image processing, and were able to contribute to scrutinize and sort in-coming data from current observing and remote sensing campaigns. Therefore, we are very interested to access additional images obtained during parallel observations with other telescopes, thereby optimizing observational techniques and improving the international coordination of future Venus observation campaigns.



## Conclusions:

Observations at visible wavelengths fail to reveal structures in Venus' clouds. UV filters working between 320 and 400 nm and UV-sensitive b/w CCD chips opened new possibilities for amateur astronomers. Useful filters and surveillance cameras fell in cost in recent years. With this equipment it is possible to unveil structures on Venus.

The influence of atmosphere can be reduced by recording thousands of single frames between 1/25 and 1/500 sec. At such short exposure time no cooling is necessary. During our observing campaign in spring 2007 we obtained best results one hour before sunset. During this time incoming and outgoing radiation are in balance.

Advantage of terrestrial observation is the documentation of global Venusian cloud-structures. Probes deliver high-resolution images of small areas: Both techniques are complementary. Amateur pictures can and should be integrated into current international observing campaigns!

## References

- [1] ESA amateur astronomer observing campaign:  
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<http://www.spaceref.com/news/viewsr.html?pid=20022>
- [2] Regularly updated international archive of amateur images of Venus:  
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[http://alpo-j.asahikawa-med.ac.jp/Latest/Policies\\_E.htm](http://alpo-j.asahikawa-med.ac.jp/Latest/Policies_E.htm)
- [3] Additional websources:  
 B. Gährken: <http://www.astrode.de/venus07.htm>  
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 M. Fiedler: <http://bilder.astroclub-radebeul.de/kategorien.php?action=showall&offset=0&kat=0&ukat=Venus>  
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 M. Weigand: <http://www.skytrip.de/venus2007.htm>
- [4] Vereinigung der Sternfreunde (VdS): <http://www.vds-astro.de/>