

The Manual for vco_widget_V2.4

Version number: 2.4

OS: Windows 32/64 bits and Linux 32/64 bits

Last update: 2020/11/20

Description of the vco_widget:

'vco_widget' is a visualization tool of Venus observation conditions from Akatsuki (VCO) and from the Earth. VCO condition uses predicted Akatsuki (VCO) kernels, so this shows an expected condition. A user should keep in mind that there is a possibility that a real observation may differ from this expectation.

Major purpose of vco_widget is to support the Akatsuki team members and ground-based observers in planning short/long-term coordinated observations with VCO.

The widget will be updated with new available kernels, and this will be named with number # in the file name "v2.#"

Vco_widget does not require any other program installations, as it contains all necessary programs.

History of updates:

2020/11/20 v2.4 Updated VCO kernels, including the latest orbit prediction
(20201022000000-20230101000000-VNS-long_eph-sc_600sec.bsp; the end of interval (ET)
is 2023 JAN 01 00:01:09.181)

2020/02/12 v2.3 Updated VCO kernels, including the latest orbit prediction
(20191201000000-20210101000000-VNS-long_eph-sc_600sec.bsp; the end of interval (ET)
is 2021 JAN 01 00:00:00.000)

2018/04/04 v2.2 Updated VCO kernels, additional surface images (thank to Toru Kouyama)

2017/07/24 v2.1 Updated VCO kernels, additional display functions, Linux version

Thanks to Shinya Murakami for help in the software installation

2016/07/04 v2.0 Additional functions in display

2016/05/26 v1.1 Updated VCO kernel

2016/04/01 v1.0

Thanks to Javier Peralta, Toru Kouyama, Takao M. Sato for help/comments

If you have any inquiries, then please send an e-mail to y.j.lee@astro.physik.tu-berlin.de (Yeon Joo LEE).
For the latest orbit prediction, please contact Masataka Imai (masataka@ep.sci.hokudai.ac.jp).

To have a quick look of example outputs, please see examples 1-4 (from the page 3).

Updates from v2.1

1. Vco kernels are updated
2. Two more options for surface images (gray scale topographic image and Kouyama et al. 2018' LIR image)

Updates from v2.0

1. vco(Akatsuki)'s kernels are updated.
2. Setting of parameters is saved for the next use.
3. Updated display functions:
 - a. Type of figure: 'Akatsuki orbit' will show the corresponding orbit at the time of Date (1)
 - b. Type of figure: 'VCO trajectory' can adjust x- and y-axis ranges.
 - c. Type of figure: 'VCO pericenter' can adjust x- and y-axis ranges.
4. Updated save function:
 - a. Button 'Save 10 seq. images' will save 10 sequential images from Date (1) to Data (2) automatically.
 - b. A user can control the width or resolution of saving files.
5. Removed a line of setting kernel directory option from the widget, but a user can modify it from './set_para.txt' directly.
6. Correction of some inconvenient part/errors. Now, users do not need to press 'enter' to change parameters.

How to start:

1. Start

Windows:

'vco_widget_v2.2_WIN.exe'

Linux:

'vco_widget_v2.2_LIN'

(For Linux, if doesn't work, then please try 'chmod +x' for all files)

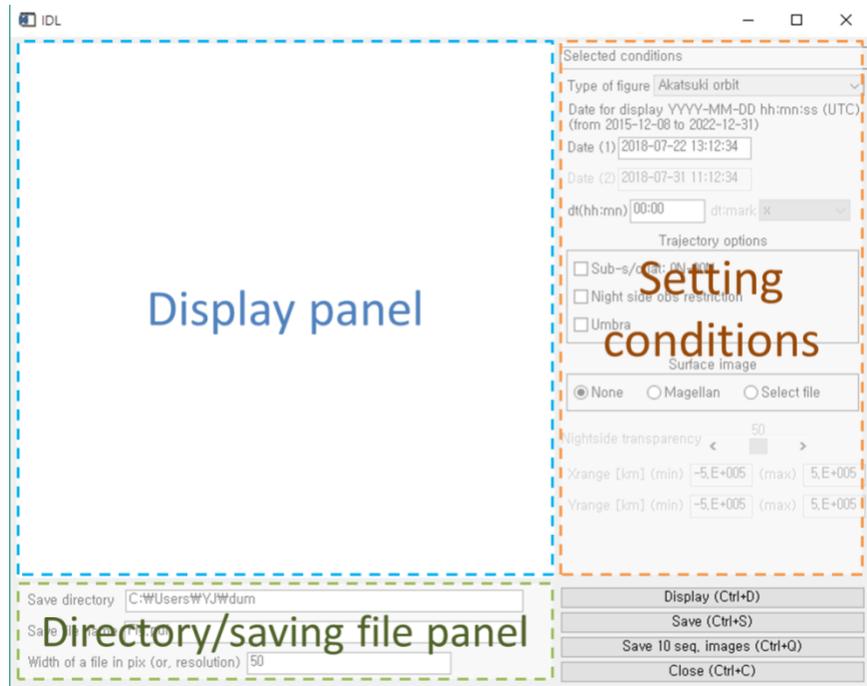
2. Click to continue

Windows:

Click 'vco_widget_v2.2_WIN' and 'click to continue'

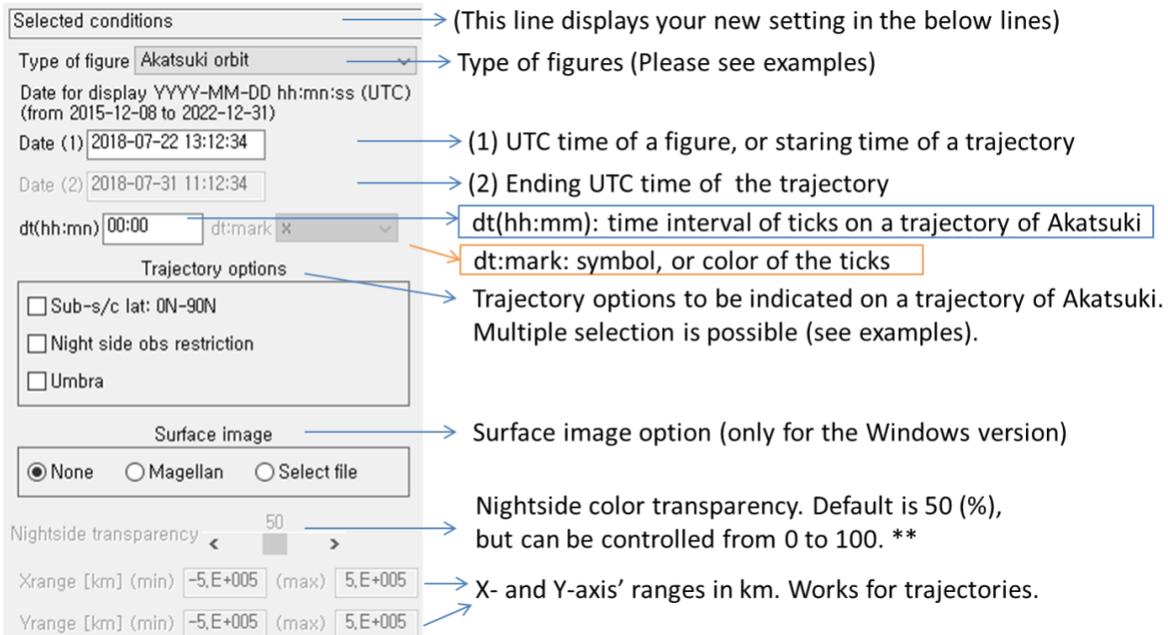
Linux:

Click the 'OK' button.



3. A window will appear as shown above. Then, it is ready to go.

[Setting]



The screenshot shows a settings window with various options. Annotations with arrows point to specific elements:

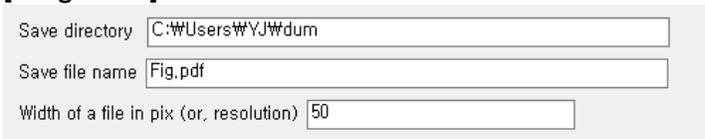
- Selected conditions**: (This line displays your new setting in the below lines)
- Type of figure**: Akatsuki orbit (Type of figures (Please see examples))
- Date for display**: YYYY-MM-DD hh:mn:ss (UTC) (from 2015-12-08 to 2022-12-31)
- Date (1)**: 2018-07-22 13:12:34 ((1) UTC time of a figure, or starting time of a trajectory)
- Date (2)**: 2018-07-31 11:12:34 ((2) Ending UTC time of the trajectory)
- dt(hh:mn)**: 00:00 (dt(hh:mm): time interval of ticks on a trajectory of Akatsuki)
- dt:mark**: x (dt:mark: symbol, or color of the ticks)
- Trajectory options**:
 - Sub-s/c lat: 0N-90N
 - Night side obs restriction
 - Umbra(Trajectory options to be indicated on a trajectory of Akatsuki. Multiple selection is possible (see examples).)
- Surface image**: None (selected), Magellan, Select file (Surface image option (only for the Windows version))
- Nightside transparency**: 50 (Nightside color transparency. Default is 50 (%), but can be controlled from 0 to 100. **)
- Xrange [km]**: (min) -5,E+005 (max) 5,E+005 (X- and Y-axis' ranges in km. Works for trajectories.)
- Yrange [km]**: (min) -5,E+005 (max) 5,E+005

*User's own (surface) image should cover lon [-180,+180] and lat [-90,+90] ranges, regardless on resolutions (jpg/jpeg formats). □ application example 2.

** Transparency of night side can be controlled, depending on purposes.

The Linux version cannot use the surface image option currently.

[Image save]



The screenshot shows the 'Image save' settings:

- Save directory**: C:\#Users#YJ#dum
- Save file name**: Fig.pdf
- Width of a file in pix (or, resolution)**: 50

Save directory: Directory to save images. Default is the widget folder.

Save file name: Users can decide any format, for example, jpg, png, pdf, eps, etc.

[Executive buttons: Display, Save, Save image sequence, Close]

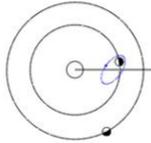
Display: Executing visualization according to the setting values.

Save: Save displayed image.

Save image sequence: Save 10 images from Date (1) to Date (2) to check the variation over time. File name will have a sequence number (\$\$\$) automatically, save_file_name_\$\$\$. See the example 4.

Example 1

2017-07-20 00:00:00UTC
r0054



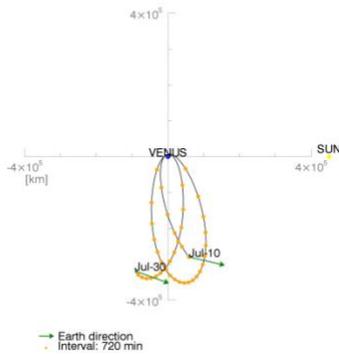
North polar view



Akatsuki orbit

The Sun, Venus, and the Earth on the ecliptic plane
The direction of major axis of Akatsuki's orbit is indicated. A schematic orbit with Venus day/night is shown below, as seen from the north of the solar system.

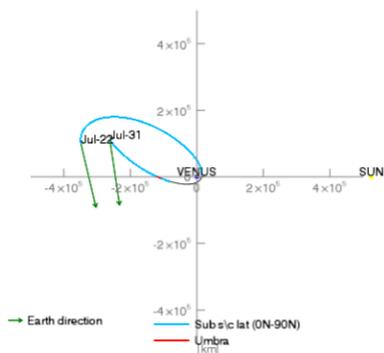
UTC:
2016-07-10 00:00:00
2016-07-30 00:00:00



VCO trajectory

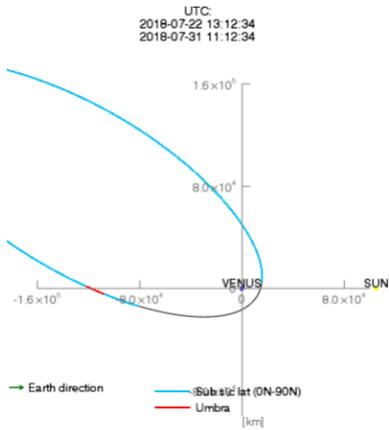
Trajectory of Akatsuki.
+X axis is assigned to the Solar direction.
The left image is the case of dt(hh:mm)='12:00', and dt:mark='orange'.

UTC:
2018-07-22 13:12:34
2018-07-31 11:12:34



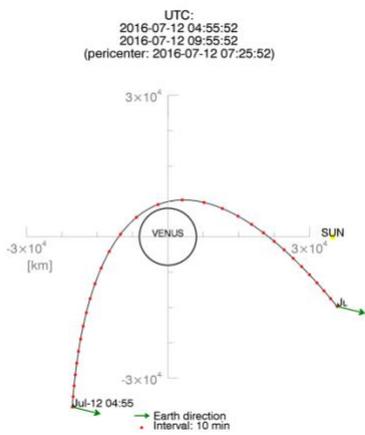
VCO trajectory

Trajectory of Akatsuki.
+X axis is assigned to the Solar direction.
The left image is the example of marking 'sub s/c latitude (0N-90N)' and 'umbra'.



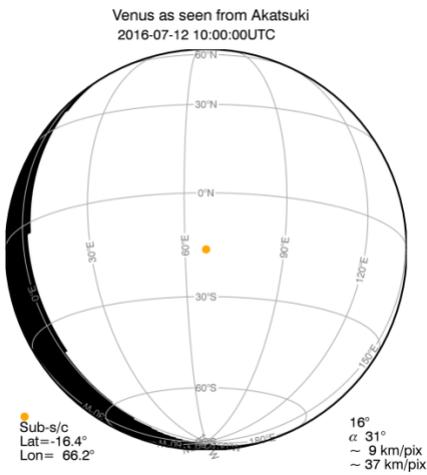
VCO trajectory, x and y range modification

Same as the above example, but different x- and y-ranges.



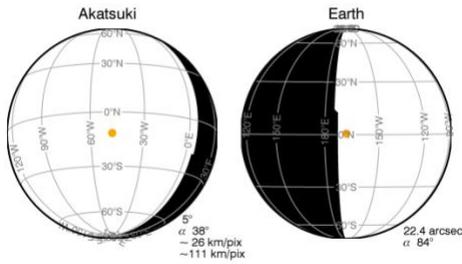
VCO pericenter

Pericenter trajectory close up during pericenter +-2 hours.
+X axis is assigned to the solar direction.
The left image is the case of dt(hh:mm)='00:10', and dt:mark='red'.



Venus as seen from Akatsuki

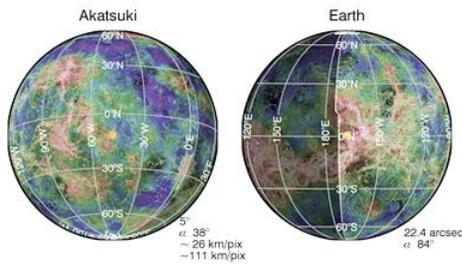
Venus
2017-01-04 10:00:00UTC



Venus coverage, VCO & Earth

Venus as seen from Akatsuki and from the Earth.
Orange dots are sub-observer points.

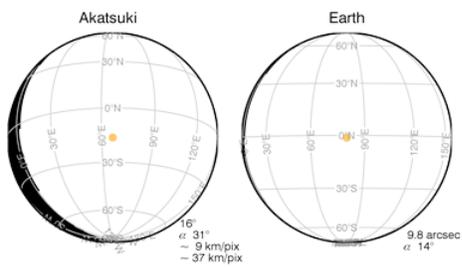
Venus
2017-01-04 10:00:00UTC



**Venus coverage, VCO & Earth
with Magellan image mapping option.**

Venus as seen from Akatsuki and from the Earth.

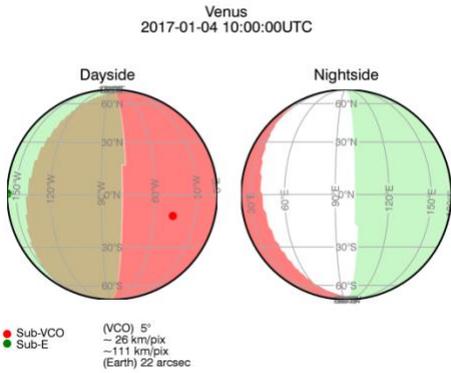
Venus
2016-07-12 10:00:00UTC



Venus is larger than FOV/Akatsuki

Venus coverage, VCO & Earth

A warning message appears when the apparent size of Venus is larger than FOV(12deg) of cameras onboard VCO. **This happens near pericenter**, and direct comparison between the FOV of VCO and Earth observations is difficult in this case. **Please contact VCO team if you want to know observational plan of VCO at this specific time.**

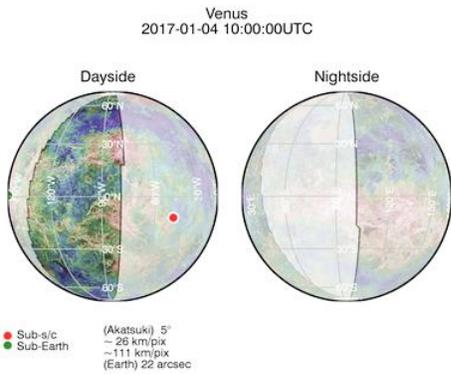


D & N Venus coverage

Coverages of Venusian day and night sides by VCO and ground-based observations.

VCO: red
Ground: green.

Overlapped area is where can be observed by VCO and ground-based observer simultaneously.

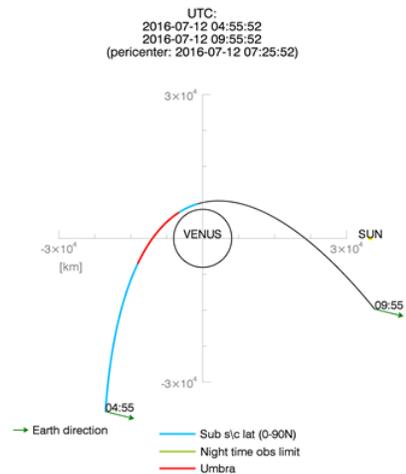


D & N Venus coverage with Magellan image mapping option.

Overlapped observable area between VCO and ground-based telescopes are highlighted with transparent surface images.

Oblique area means none of them can observe at this specific time.

Example 2. The observational condition for the pericenter on 12th July.



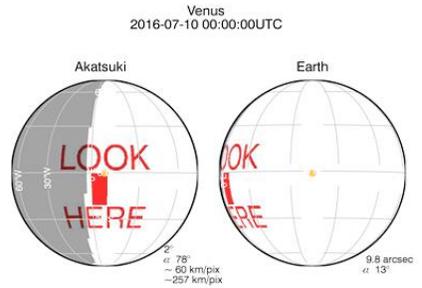
Example 3. Highlight user's target of interest regions (This works on for the Windows version).



A 720x360 pixel image with a mark of interest (0-10E, 0-20S).

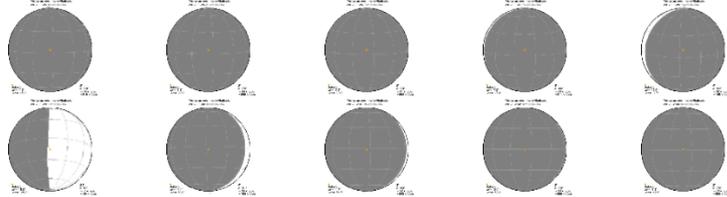


Venus as seen from Akatsuki. It is possible to over plot the left sample image though this process, surface image-select file-select 'test_mark_0-10E_0-20S.png', and then press 'Display'.



Similar one is possible for **Venus coverage, VCO & Earth.**

Example 4. Save image sequences around 2017-11-29 pericenter passage of Akatsuki



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