



Improved Cloud Tracking System for Akatsuki and Venus Express

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Today's talk

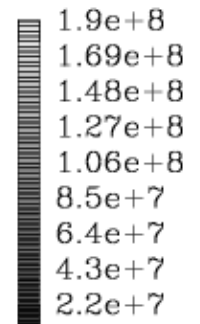
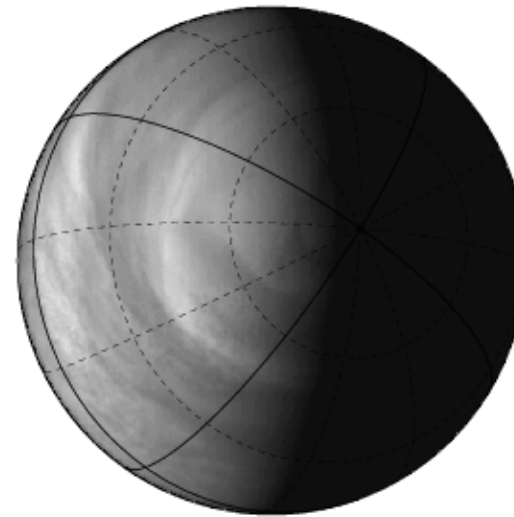
- Sophistication of our cloud tracking system using Venus Express/Venus Monitoring Camera
 - Correction of attitude information
 - Consideration of quality control
- Cloud tracking from the new orbit (50Rv)
 - Comparison between VEX/VMC and Akatsuki

V0250_0008_UV2_L3a.NC

2006-12-2

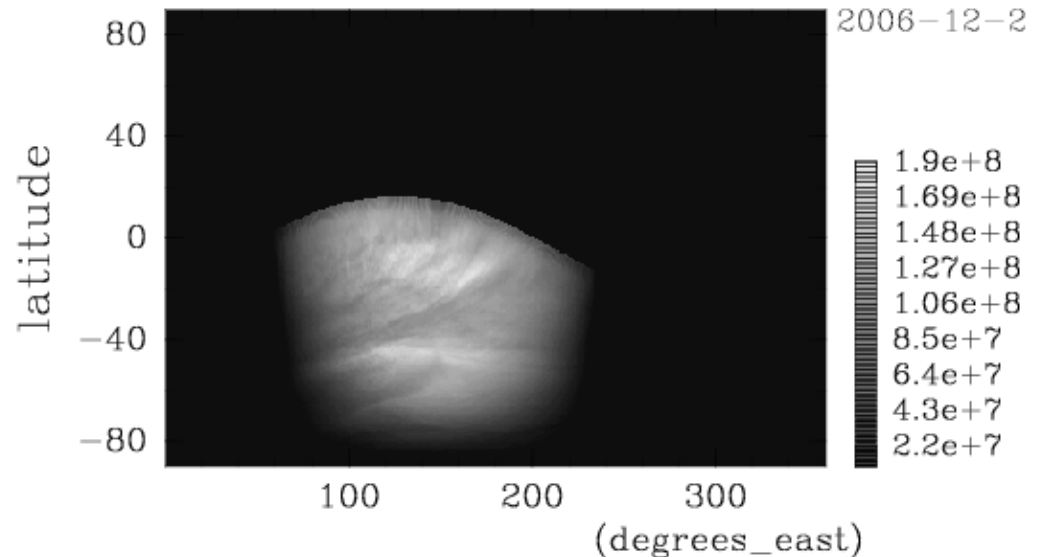
Level 3a/Level3b

e. g. orbit 0250



radiance

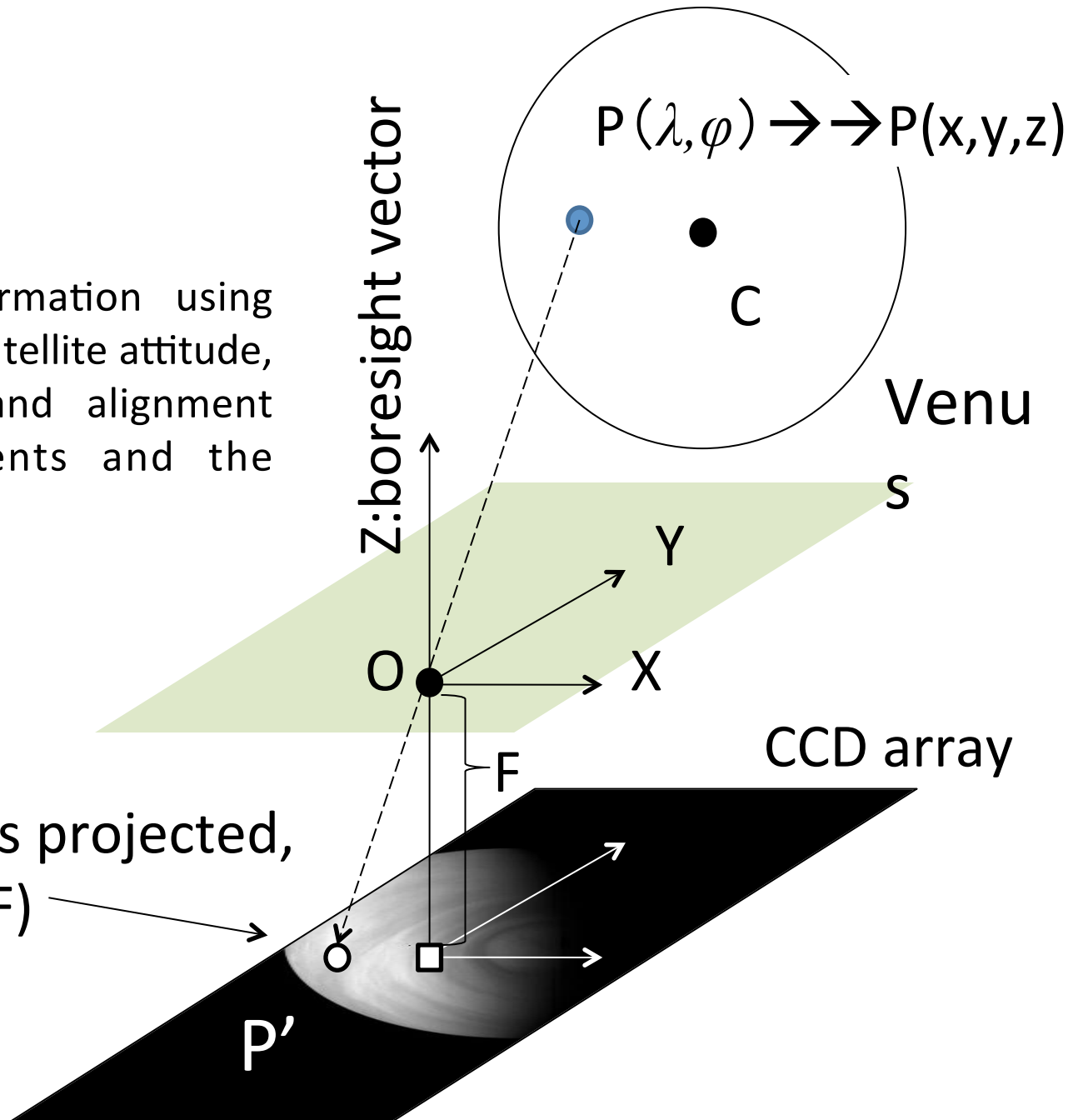
(degrees_north)



Good Case

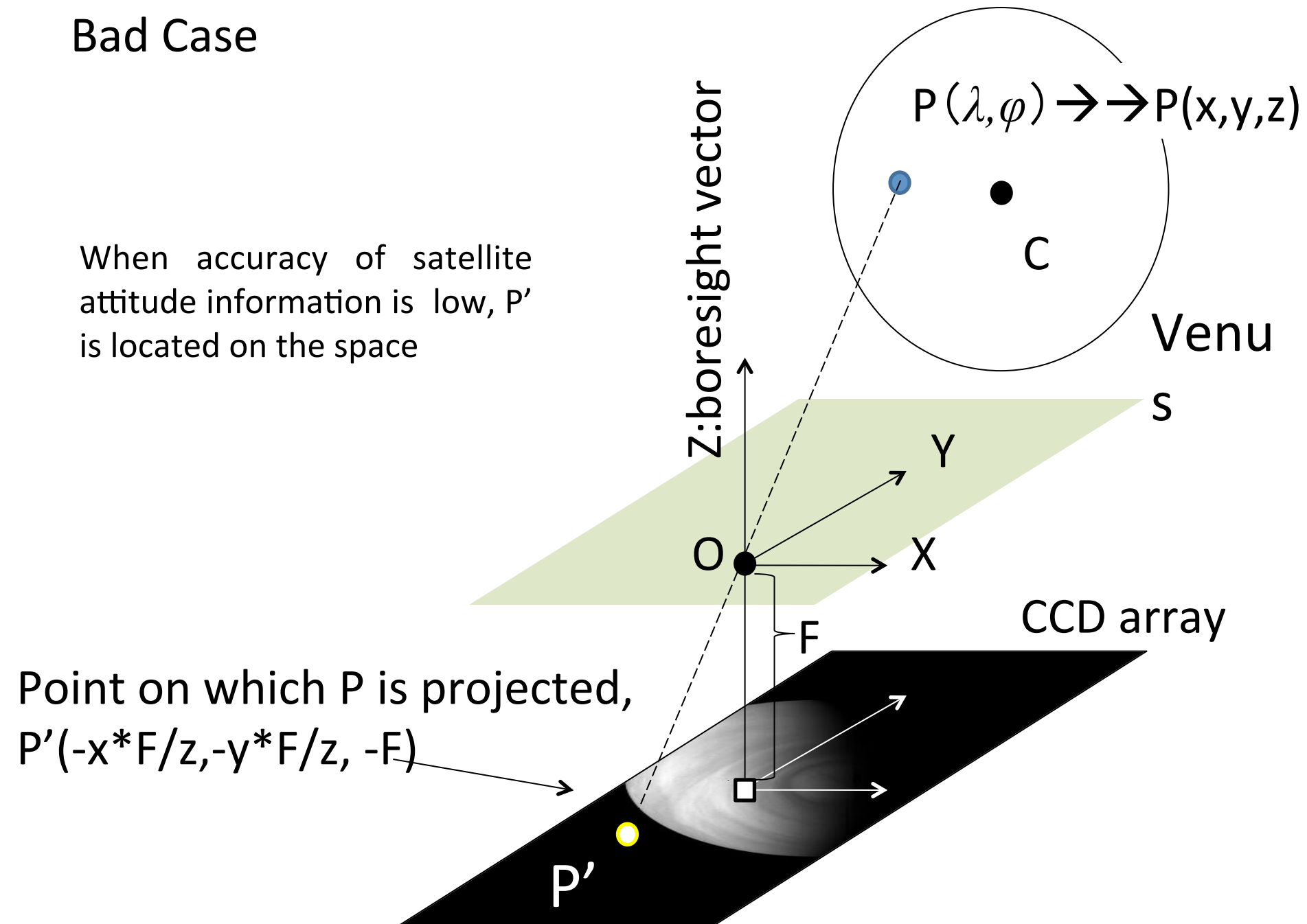
Coordinate transformation using information about satellite attitude, satellite position and alignment between instruments and the satellite

Point on which P is projected,
 $P'(-x * F/z, -y * F/z, -F)$

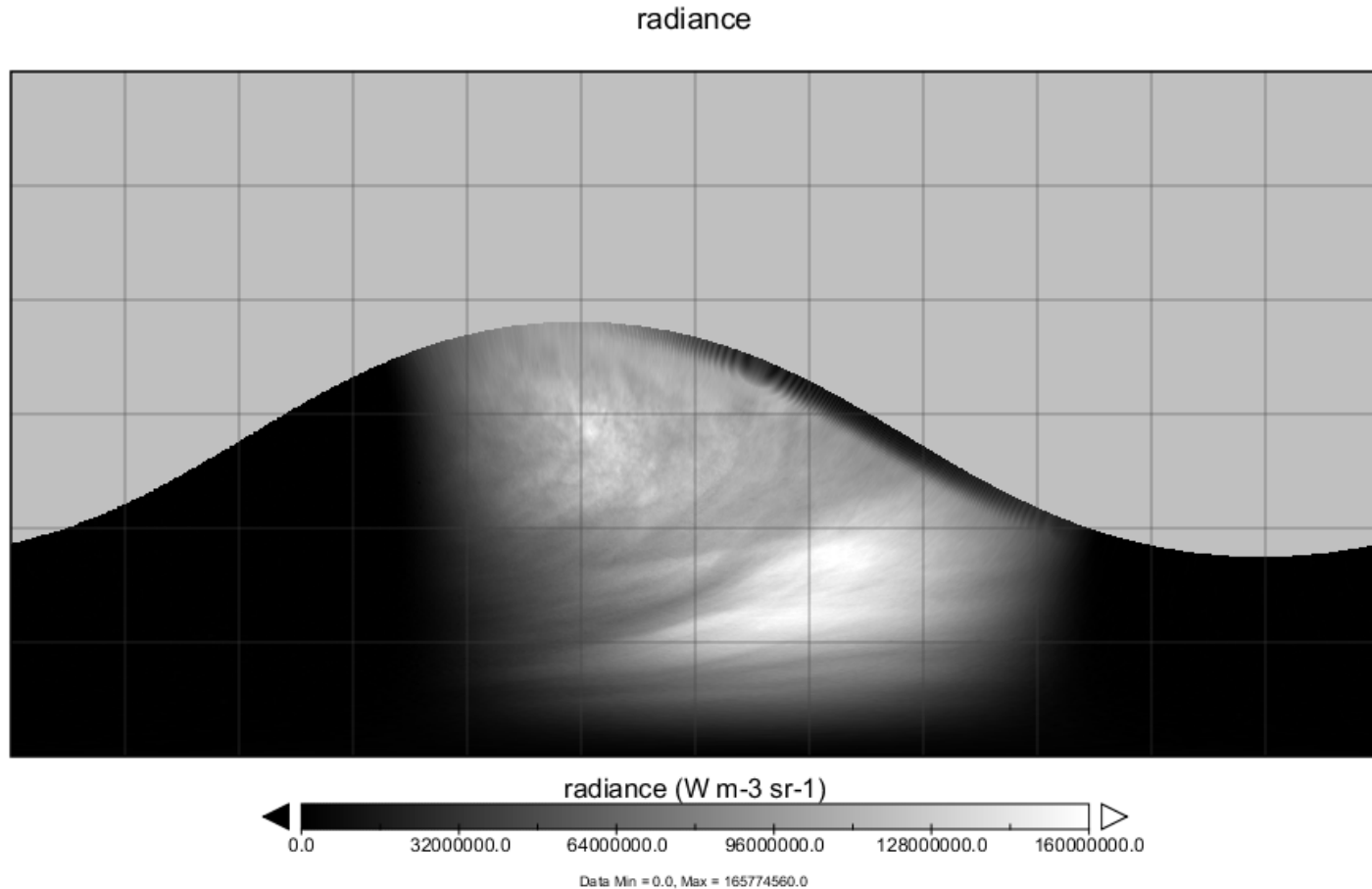


Bad Case

When accuracy of satellite attitude information is low, P' is located on the space

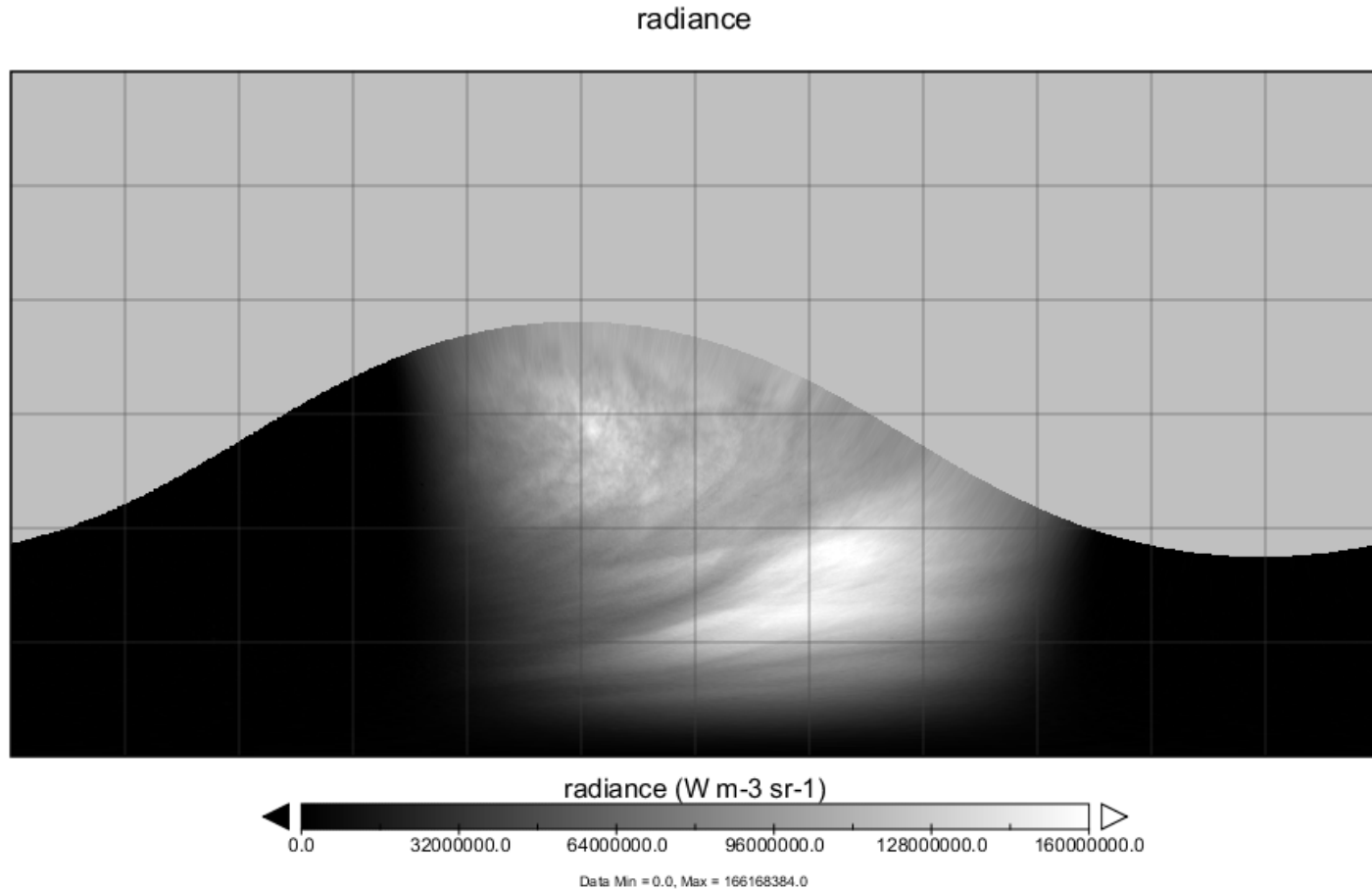


Longitude-latitude map (previous ver.)

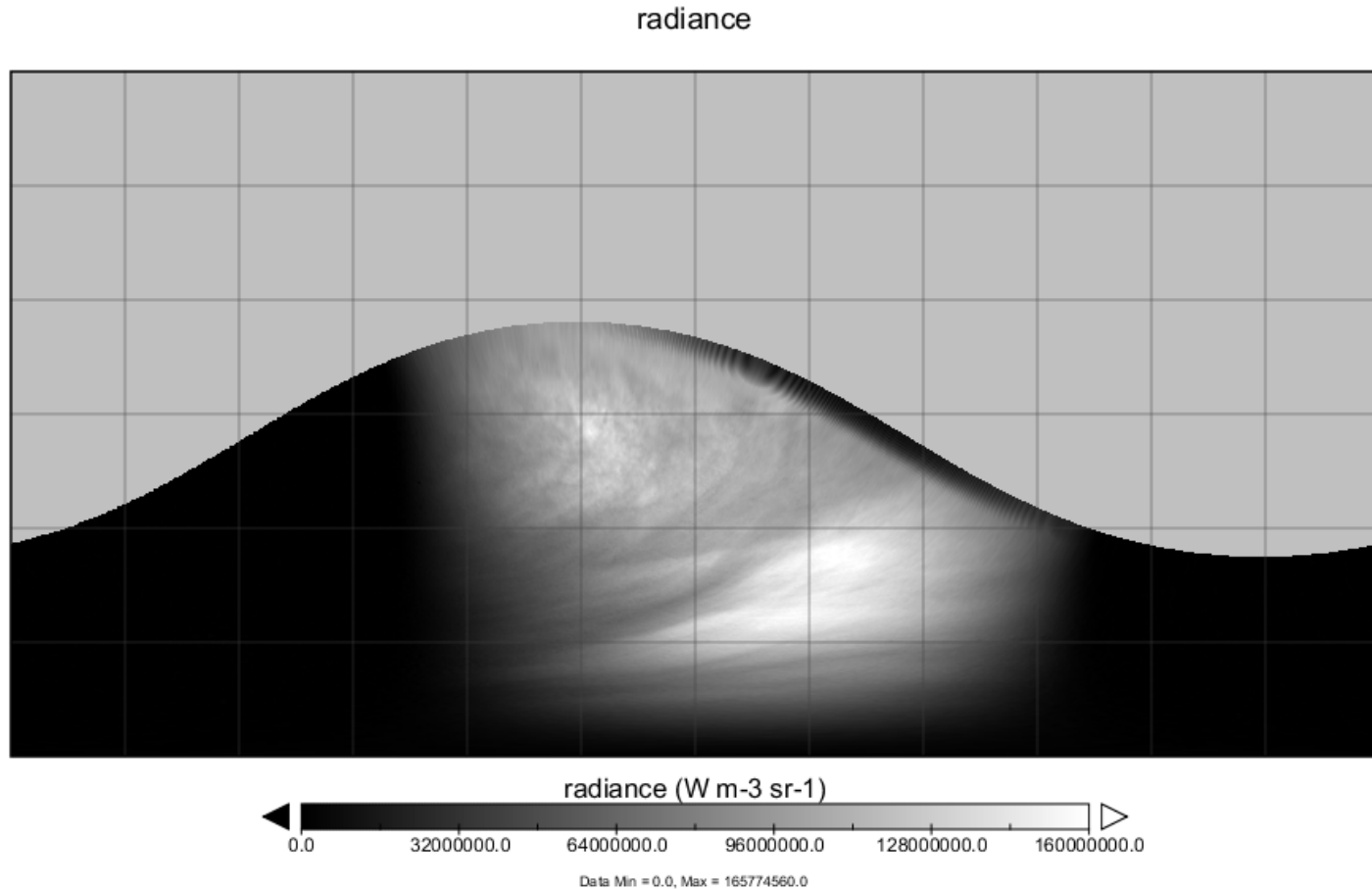


- Correction of a Venus-Instrument vector using the size and ellipticity of a Venus disk (ellipse)
- See Ogohara et al. (2012a, 2012b)

After the correction



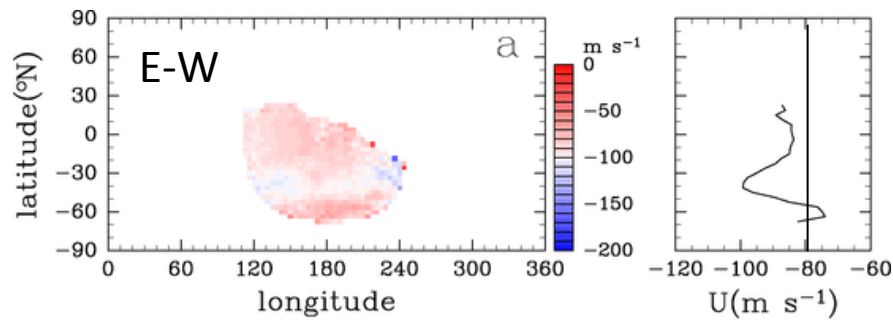
Before the correction



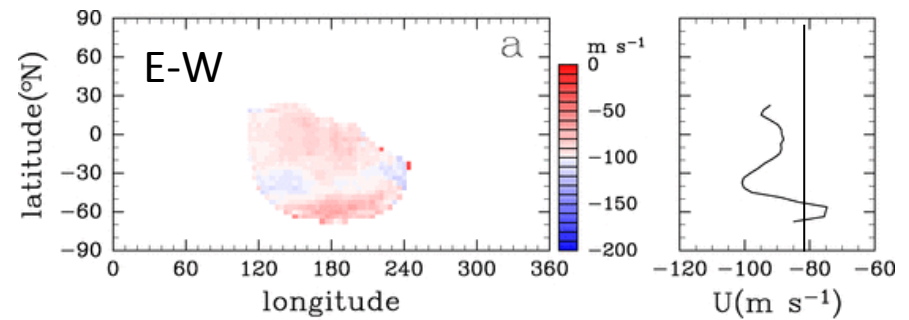
Results of cloud tracking

e.g. average among orbits 0030, 0031, 0034, 0038, 0046, 0051, 0056, 0060, 0061

Before correction



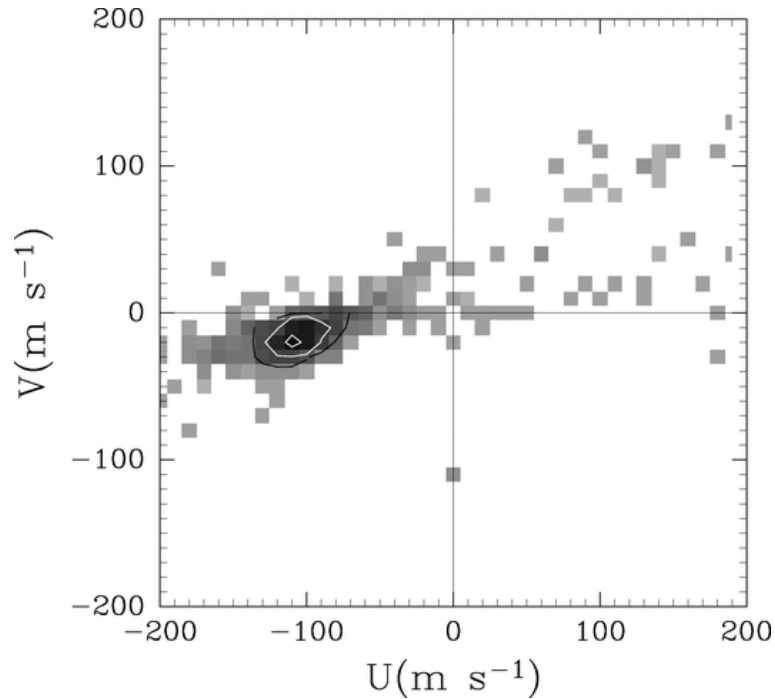
After correction



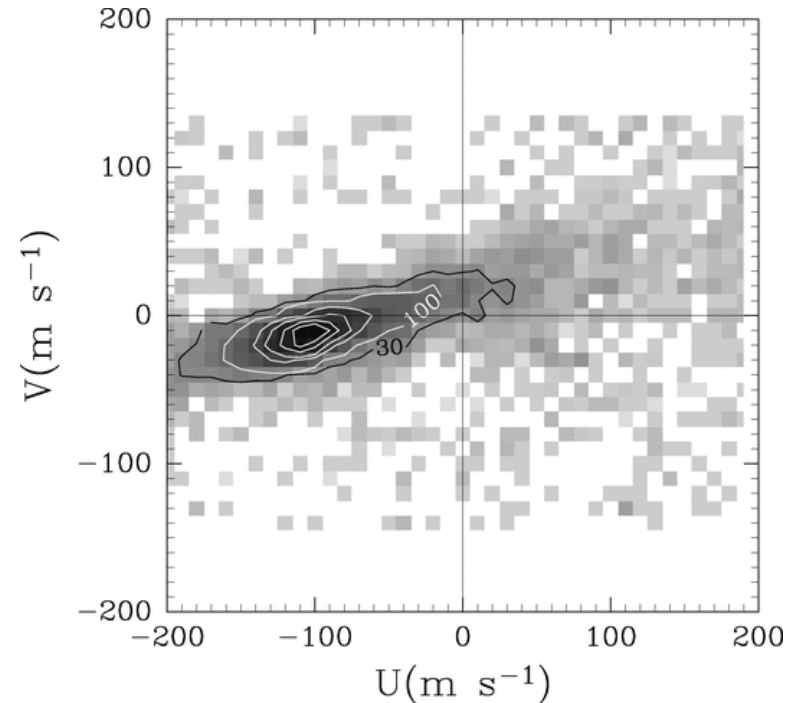
resolution : 96x48 (3.75°x 3.75°)

U-V scattering plot (20S~40S)

Orbit 0056



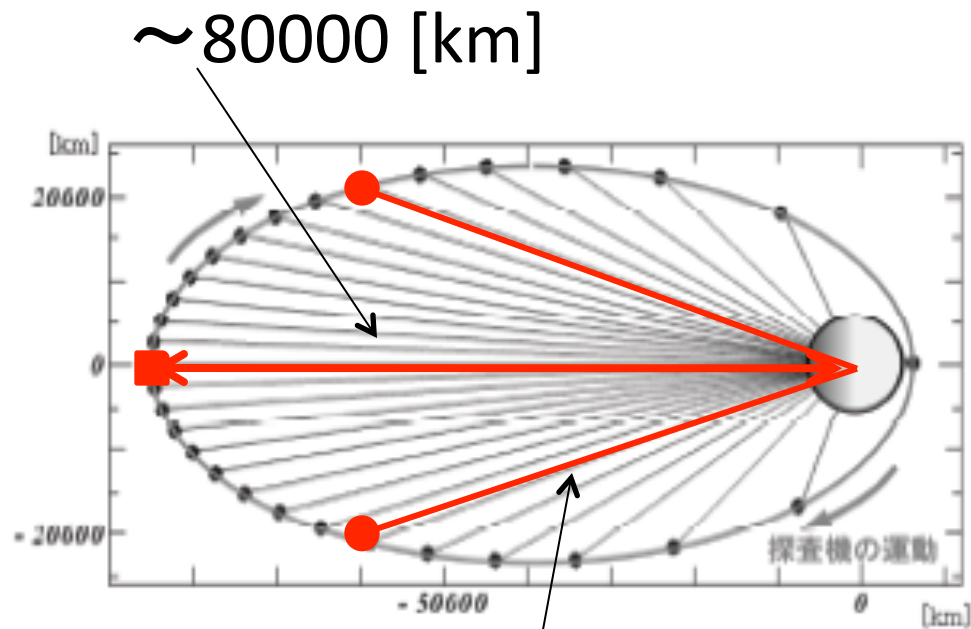
Orbit 0030~0056



- Are $U > 0$ m/s vectors really incorrect?
- Appropriate (physics-based) quality control is needed.

Cloud tracking from new orbit

original orbit



1024 pix

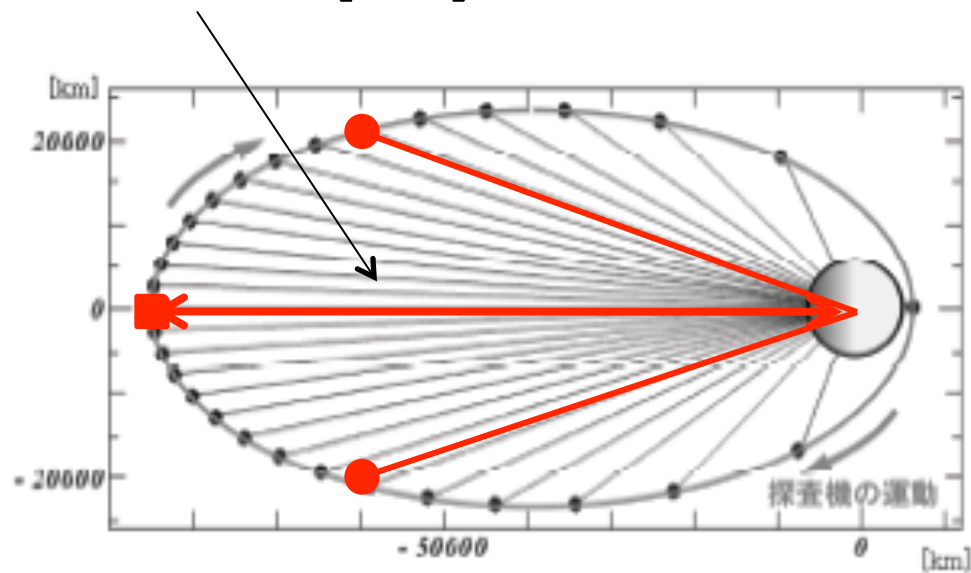


1024 pix

~60000 [km]
FOV=12 deg

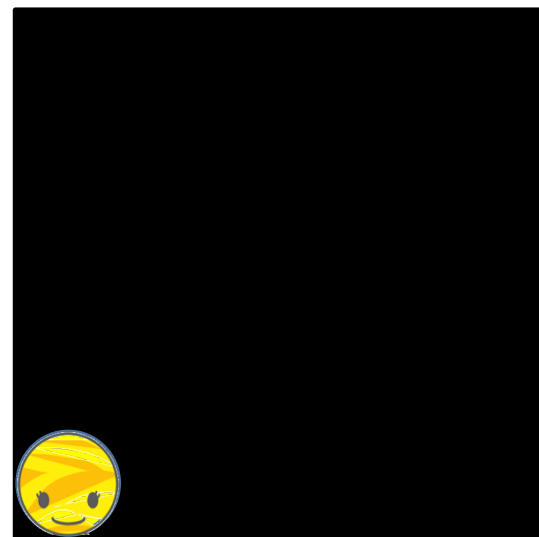
New orbit

~320000 [km]



Location of S/C

1024 pix

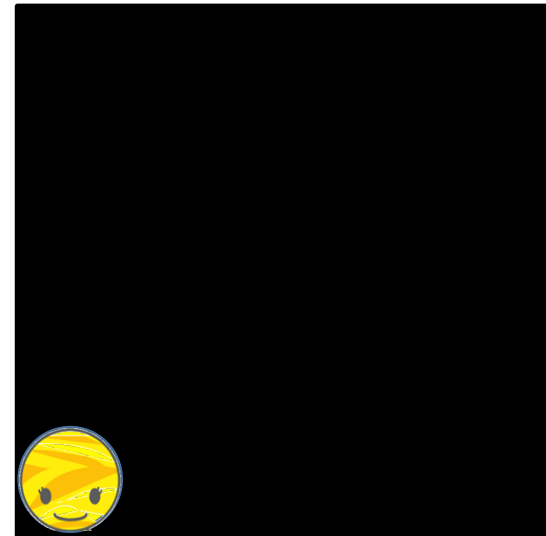


1024 pix

Level 3a/3b

- Venus disk $\sim 200 \times 200$ pixels at apoapsis
- Resolution near sub-satellite point at apoapsis
 $314000 \text{ km} \times \tan(12 \text{ deg} / 1024 \text{ pix} * 2\pi/360.)$
 $\doteq 64 \text{ km/pix.}$
- In a longitude-latitude map,
 $0.6[\text{deg}] \times 0.6 [\text{deg}].$
- $\rightarrow 600 \times 300$ grids

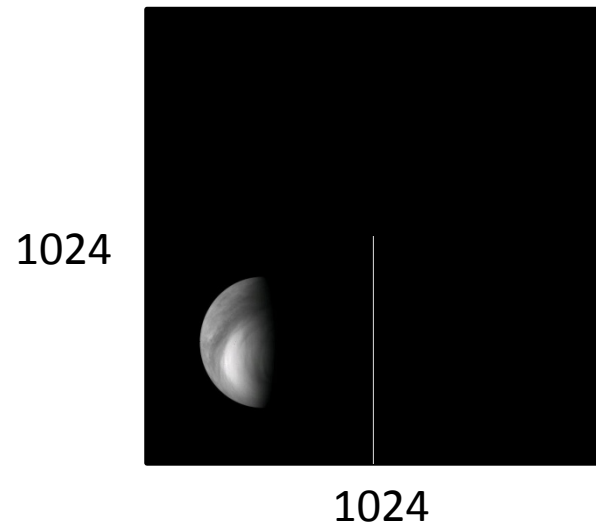
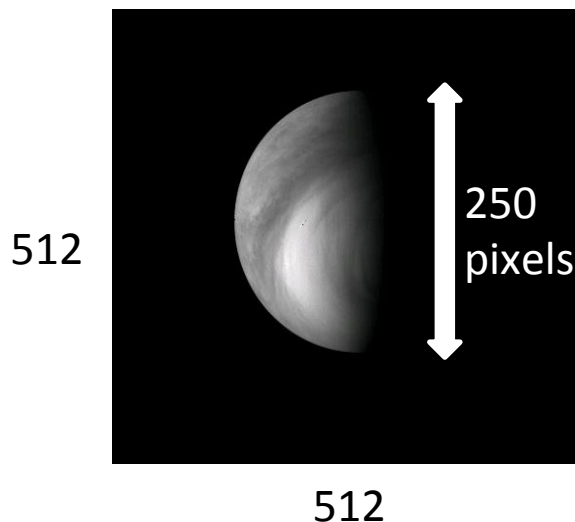
1024 pix



1024 pix

Comparison with VEX/VMC

- [VMC] Venus disk acquired around the apoapsis $\sim 250 \times 250$ pixels
- [VMC] Venus disk $< \sim 400 \times 400$ pixels
- Spatial resolution is comparable with VMC's. We don't have to be pessimistic. In addition, duration of a continuous observation is longer than VEX's.



Summary

- Don't be pessimistic.
 - Spatial resolution is comparable with other instruments.
 - Time resolution can be also comparable.
 - More continuous observations are possible.
- Improved cloud tracking system has already been ready.
 - Correction of attitude (accuracy of Akatsuki's attitude is not good)
- Effort to avoid noise is most important.
 - No cloud tracking system can derive cloud motion vectors correctly from noisy images.