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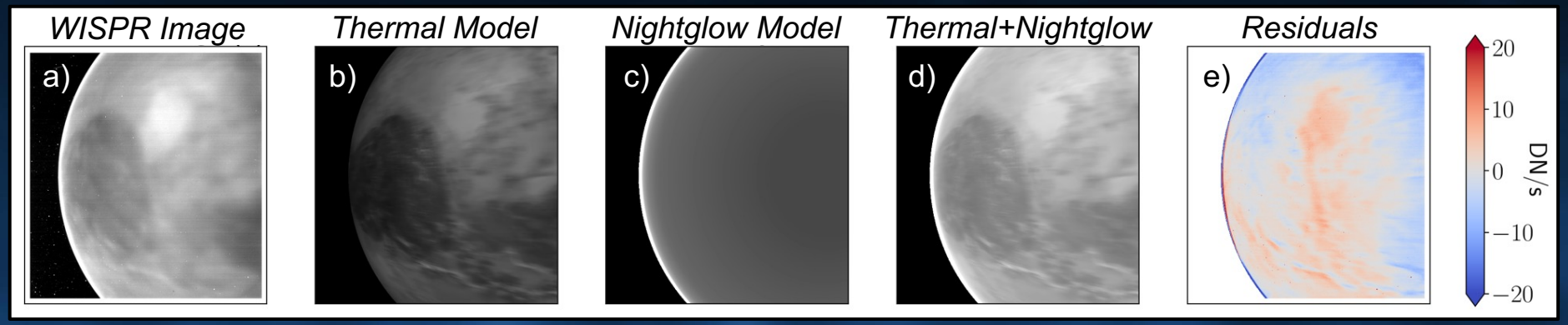
A WISPR of the Venus Surface: Analysis of the Venus Nightside Thermal Emission at Optical Wavelengths

Venus nightside images obtained by Parker Solar Probe's Wide-field Imager for Solar PRobe (WISPR) cameras discover a new opacity window, enabling new insights on the Venus surface

- The remote study of Venus is challenging due to the thick, cloudy atmosphere, but nightside opacity windows enable lower atmosphere and surface science.



A WISPR image (a) is best-fit by thermal emission from the Venus surface (b) added to nightglow emission from O_2 (c). Emission features largely track with surface temperature as it changes with elevation. Residuals (e) from the combined models (d) may indicate surface composition differences or atmospheric heterogeneities.

- The WISPR images (panel a) reveal detailed sensitivity to the Venus surface, well explained by thermal emission from the surface (panel b) emerging from the atmosphere through a new opacity window, with overlying O_2 nightglow (panel c) that is present across the Venus disk and strongly limb brightening.

- Controlling for elevation, Ovda Regio tessera is brighter than Thetis Regio; likewise, the volcanic plains of Sogolon Planitia are brighter than the surrounding regional plains units. These findings indicate different initial composition, weathering, or particle sizes for otherwise similar geologic units.

Lustig-Yaeger et al. (2023) *The Planetary Science Journal*