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The Annual Variation in the Moon‘s Brightness Temperature

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11.3.2026

Foto: UHH/Lutsch

Two Statements

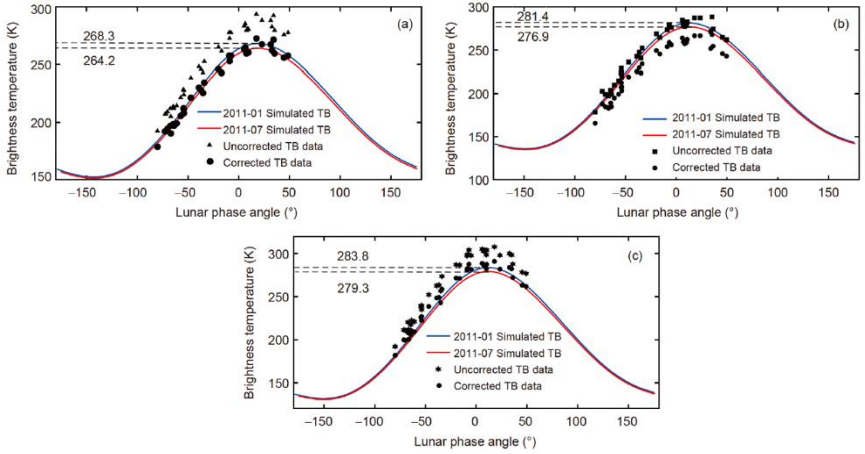
Bennett et al. (G. Smoot, J. Mather), *COBE* DIFFERENTIAL MICROWAVE RADIOMETERS, 1992

3.2. *The Lunar Model*

phase, observing frequency, and polarization. The eccentricity of the Earth's orbit leads to a predicted small (~1 K) annual variation in the daily average surface temperature. This has

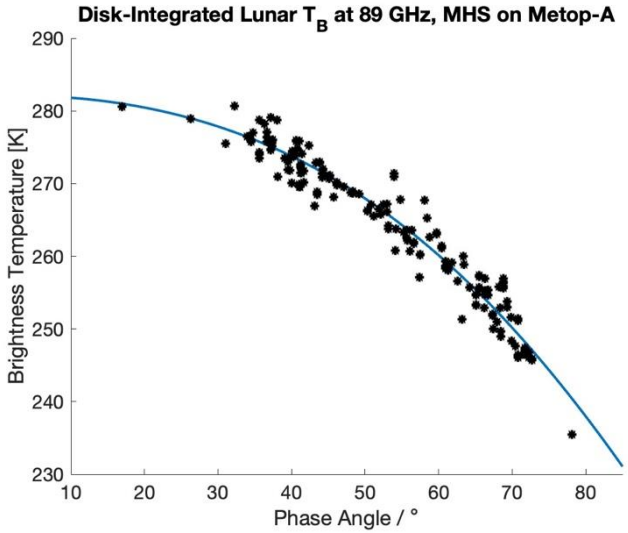
DMR measured at 3 frequencies (31.5, 53, and 90 GHz) and near ±90° phase.

LIU & JIN, 2021

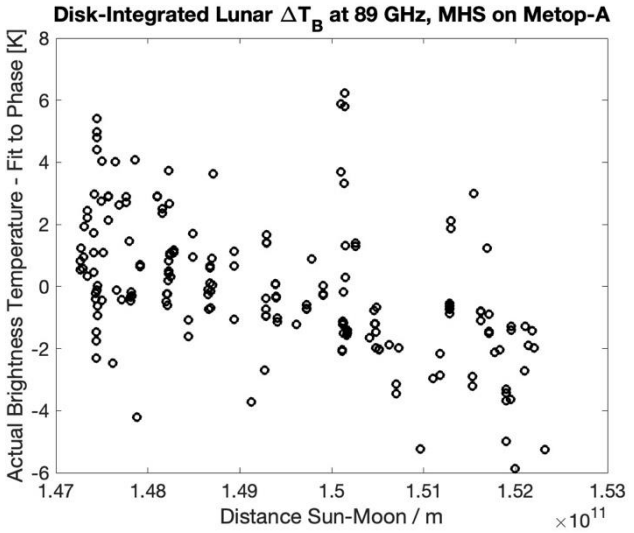


Observations Must Decide

MHS on Metop-A, 2006 - 2021



Temperature Difference Between Perihelion and Aphelion > 1 K



Annual Variation of Brightness Temperature (4 Sat.)

Frequency	Bennett	Liu & Jin (ΔTb_{max})	MHS (95% Bounds)
190		4.5 K	3.1 ± 0.4 K
183		4.5 K	3.4 ± 0.3 K
157		4.5 K	3.0 ± 0.5 K
89/90	$\approx$ 1 K	4.1 K	2.9 ± 0.5 K

Open Questions and Discussion

- Liu & Jin (2021) are in agreement with the observations.
- Bennett et al. (1992) are not, and they had annual systematic error
- “Distance“ Sun - Moon not mentioned in Keihm et al., 2025
- How does difference between perihelion and aphelion depend on
  - frequency?
  - phase angle?
- Check results from MHS with AWS, …?
- Absolute TB uncertainty level of Moon ±2 K can be achieved.

Kontakt

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