Checking on the Uniformity of Sounding Channels With the Moon

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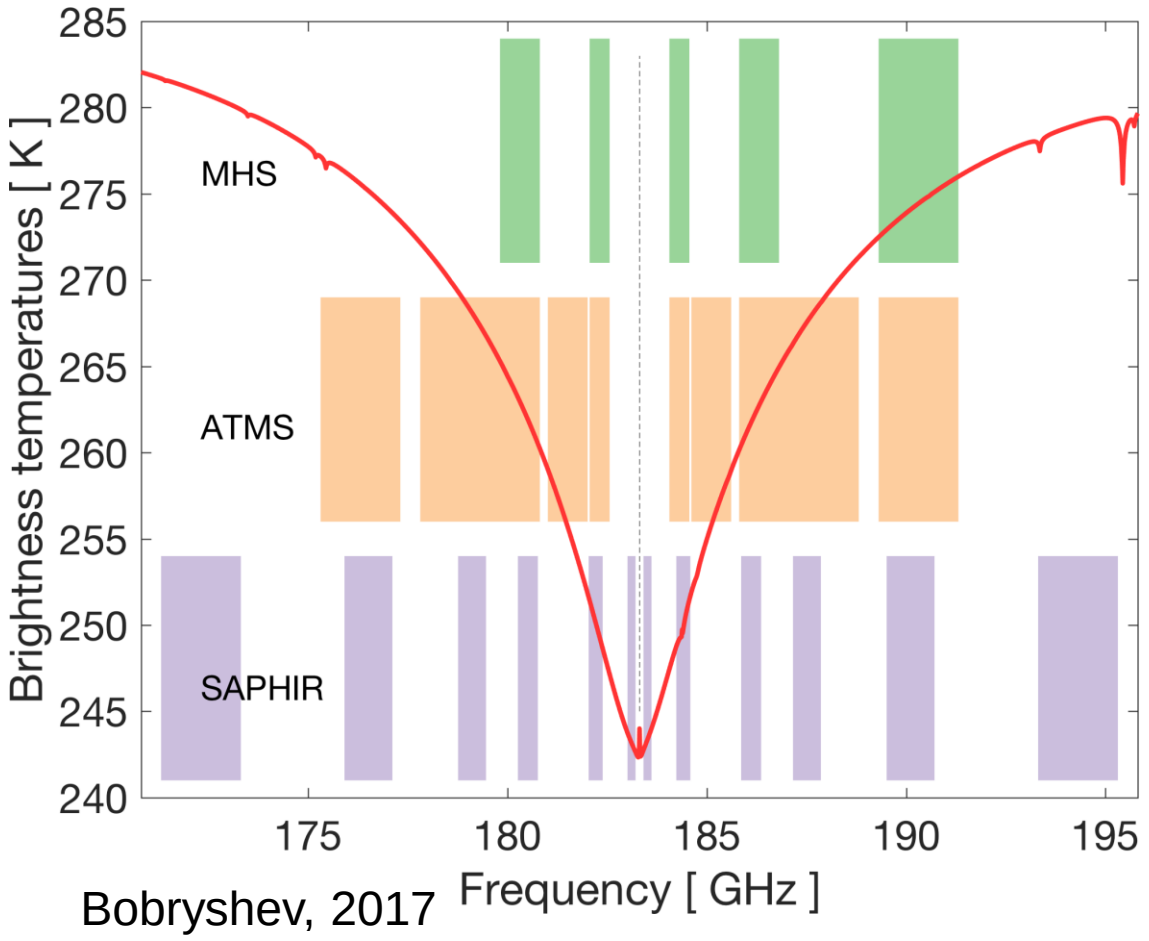
Talk Structure

- The Moon as Reference
- Example: Bias of AMSU-B on N16
- Conclusions

The Moon as Reference (I)

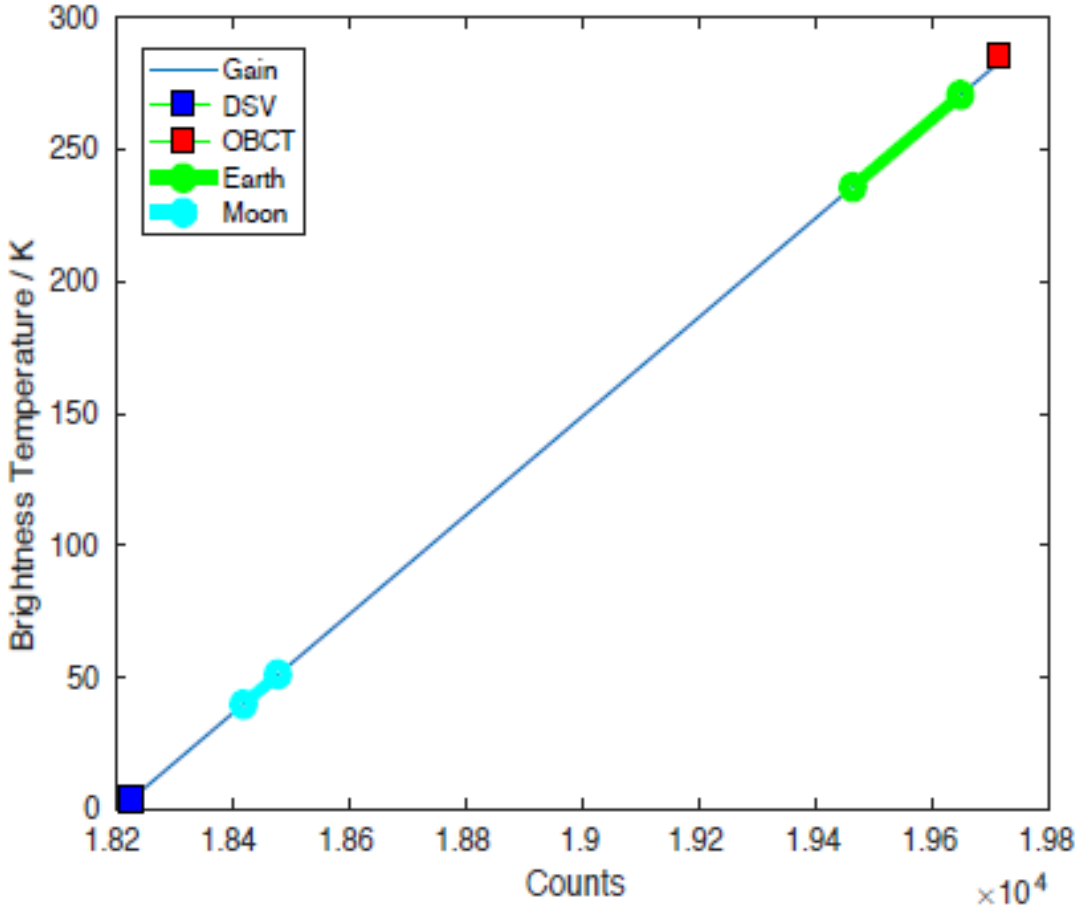
- Common reference for all satellites, past, present, and future
- Potential replacement of SNO for inter-calibration
- No atmosphere => no spectral lines => channels with the same central v get the same R_v



Bobryshev, 2017

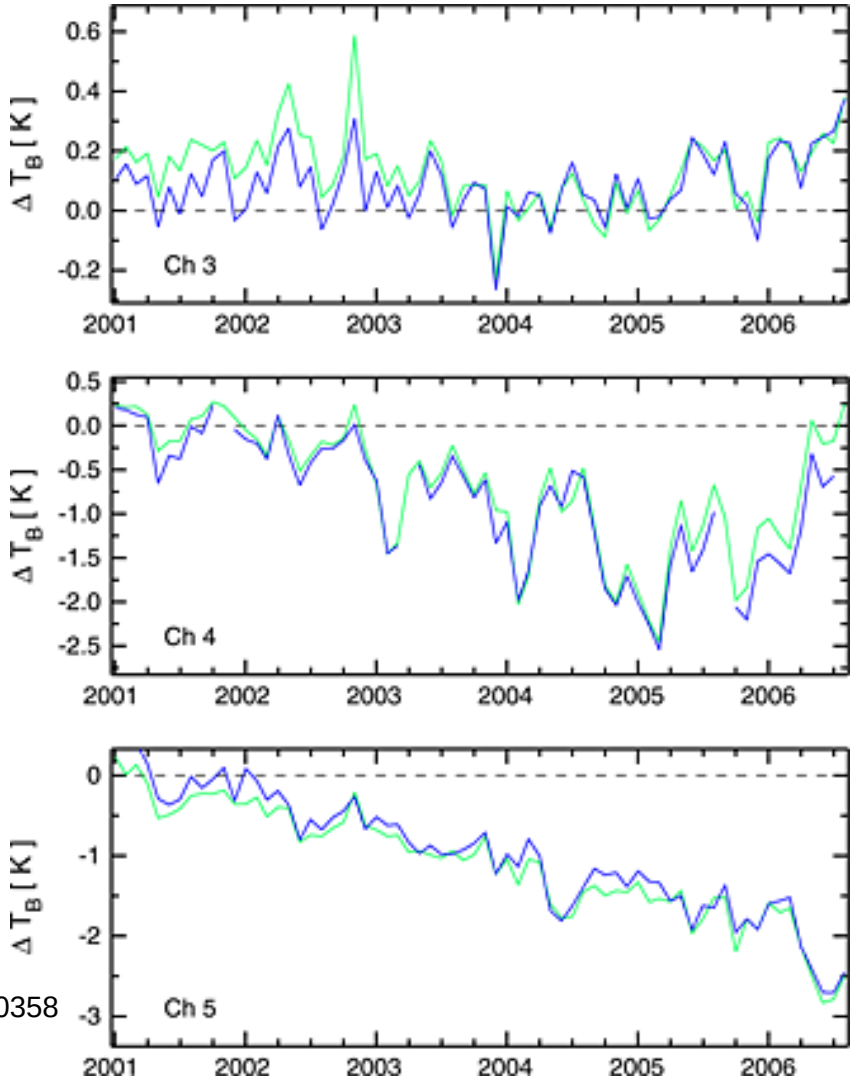
The Moon as Reference (II)

- The Moon does not fill the beam of the instrument
- $R^{moon} << R^{earth\ scene}$
- Bias between satellites different for Earth and Moon
- Derive constraints on uncertainties of instrumental constants



Example: Bias of AMSU-B/N16 (I)

- "Channel 5 on N16 shows […] the largest bias which reaches 10 K by the end of 2010." (John et al., 2013)
- The 3 sounding channels give the same signal when observing the Moon.
- Bias due to non-linearity?
- Q proportional to $(C_E - C_{ICT}) \times (C_E - C_C)$
- $Q^{moon} = 9 \times Q^{tropical\ ocean}$, but no such discrepancy found



John et al., Journal of Geophysical Research: Atmospheres
Volume 118, Issue 10, pages 4906-4918, 20 MAY 2013 DOI: 10.1002/jgrd.50358
http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50358/full#jgrd50358-fig-0007

Example: Bias of AMSU-B/N16 (II)

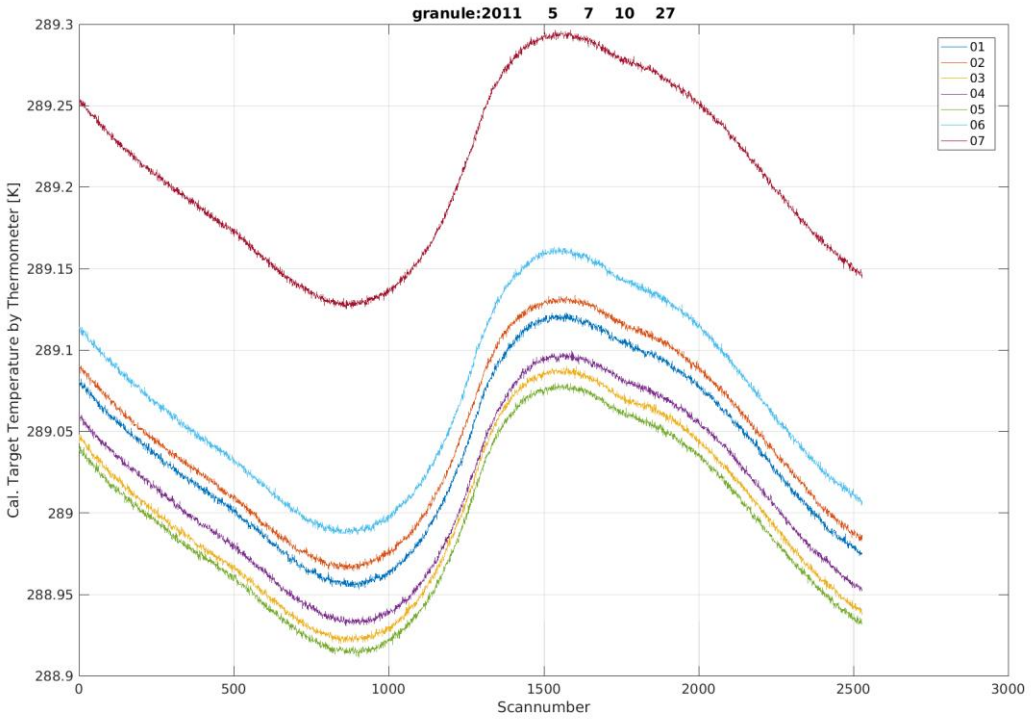
- Bias due to cold space temperature bias correction?

$$R_{\mathrm{ME}} = R_{MS} + \frac{R_{MICT} - R_{MS}}{\overline{C}_{ICT} - \overline{C}_S} \times (C_E - \overline{C}_S) + DR_{nl}(C_E)$$

- $\delta R^{moon} = 39 \times \delta R^{tropical\ ocean}$, no such discrepancy found

- ICT OK, so instrumental constants in measurement equation are not to blame.

- Frequency shift can be ruled out (common LO)



Conclusions

- Observations of the Moon offer unique possibilities to check the stability and uniformity of sounding channels and to determine the cause for inter-satellite bias.
- No knowledge of the brightness temperature of the Moon is necessary.
- RFI not negligible with AMSU-B on N-16
- No simple relationship between T_{Scene}, bias