

## ***Interactive comment on “Possible shift of spectral response function of the MODIS 6.8 $\mu\text{m}$ water vapor channel causing a cold bias up to 3 K” by B. J. Sohn et al.***

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Received and published: 12 August 2010

### **General Comments**

The paper presents a nice example of the application of an inter-calibration technique to assess the calibration of one MODIS water vapour channel using IASI as a reference standard.

The presented analysis finds a systematic bias in the MODIS observations relative to IASI, which is found to be seasonally dependent. The authors suggest that the bias can be explained by a shift in the spectral response function (SRF) of the MODIS

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6.8  $\mu\text{m}$  channel. However, no theoretical background is provided to give technical support to this hypothesis. The authors should state whether the proposed 11  $\text{cm}^{-1}$  shift is reasonable given the levels of uncertainty with which the SRF was originally characterised and why a bulk shift of SRF was selected in preference to the many other modifications to the SRF that could reproduce the observed pattern of biases.

My main criticism of the manuscript is that it does not specify the uncertainties at any stage of the analysis. While it is recognised that producing a full error budget of each component of the process is not trivial, it would still be beneficial to the readers to evaluate the uncertainty of the quoted biases of -3.06 K and -2.02 K by analysis of the regression statistics.

Also, it is apparent from the figures that the slopes of the regressions are not equal to 1. This means the bias will depend on the radiance at which it is evaluated. The relevant radiance (or brightness temperature) should be specified in the text.

Throughout the paper the term “up to 3 K” is used to describe the bias found. While this may be correct, it begins to sound like a newspaper headline. I suggest replacing this by “2 – 3 K”, at least in the abstract and conclusion, as it is shorter and more accurately describes the findings.

While it may be beyond the scope of this paper, the authors should recognise that method presented would be equally applicable to many other MODIS channels.

Overall, I support the publication of the paper after minor revisions given the importance of this analysis to the application of data from MODIS, the use of which is widespread throughout the remote sensing community.

### **Specific Comments**

Equation (2) performs a comparison based on the regression of collocated brightness temperatures. However, as both instruments’ measurements are most closely related to radiances and their calibration is done in radiance-space, this would seem to be

the natural choice for the comparison. (The radiance biases can still be converted to brightness temperatures for convenient presentation.) The authors should check whether similar results are produced when performing the comparison in brightness temperatures and radiances and comment on their findings.

p.3282 The text describing the method is difficult to follow as it contains many terms that sound similar. The authors should consider introducing some clear symbols and using these to refer to each term.

p.3282.26 Another advantage of the spatial averaging is that it can also mitigate geolocation errors.

p.3285.5 A reference should be cited to support the underlying assumption that there is a strong seasonal cycle in the upper tropospheric humidity – ideally specifying its relative variability.

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Interactive comment on *Atmos. Meas. Tech. Discuss.*, 3, 3277, 2010.