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Calibration of AMSR2 L1B data using RTM

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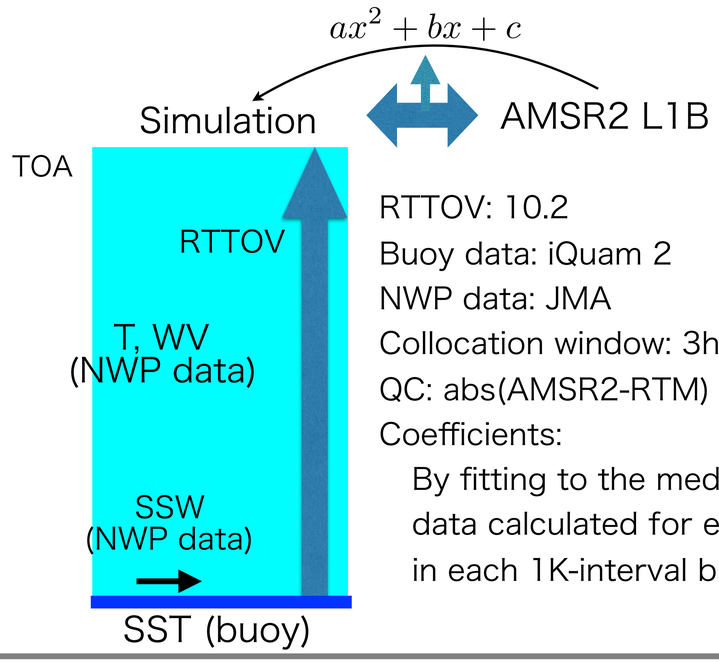
1. Introduction

It is almost twenty years since the launch of the first AMSR sensor (AMSR-E), and currently, AMSR2, the third AMSR sensor, is operating. On the other hand, SGLI, an optical sensor onboard the GCOM-C satellite, is operating since 2018. Both AMSR2 and SGLI bring us information of the sea surface temperature (SST)[1]. However, unnatural differences are often found between the AMSR2 and SGLI SSTs, and the same applies between AMSR and other thermal infrared (TIR) SSTs. In some SST analysis, those differences are addressed by empirical bias correction; however, it removes significant differences as well.

It is considered that the difference between AMSR and TIR SSTs is originated from the different spatial resolution, the different observation time, theoretical limits, and sensor- and algorithm-specific errors. To improve the combined use of AMSR and TIR SSTs, this study aims at improving the sensor- and algorithm-specific errors in AMSR SSTs by the introduction of re-calibration and a radiative transfer theory (physics)-based SST method.

For the development of the physics-based SST method, we investigated the effect of re-calibration on SST determination using AMSR2 L1B data. The re-calibration was made by using numerically generated atmospheric data, in-situ buoy data, and an RTM (RTTOV 10.2). For validation, we retrieved AMSR2 SSTs with a trial version of the physics-based method and compared the results with buoy data. This poster discusses the re-calibration and the validation results that show the effectiveness of the re-calibration.

2. Re-calibration method



RTTOV: 10.2
Buoy data: iQuam 2
NWP data: JMA
Collocation window: 3hr x 3km
QC: abs(AMSR2-RTM) < 5K
Coefficients:
By fitting to the medians of RTM data calculated for each AMSR2 BT in each 1K-interval bin.

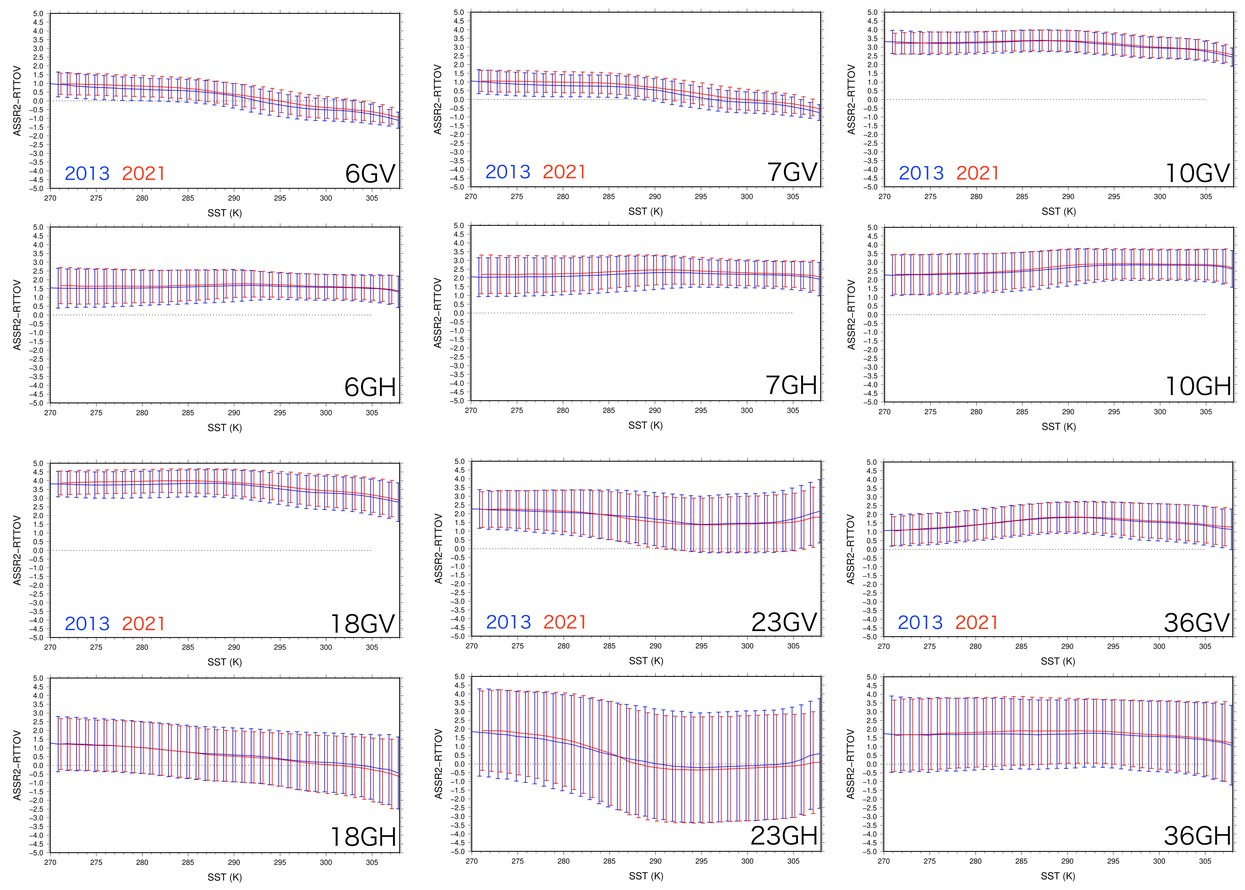


Figure 2

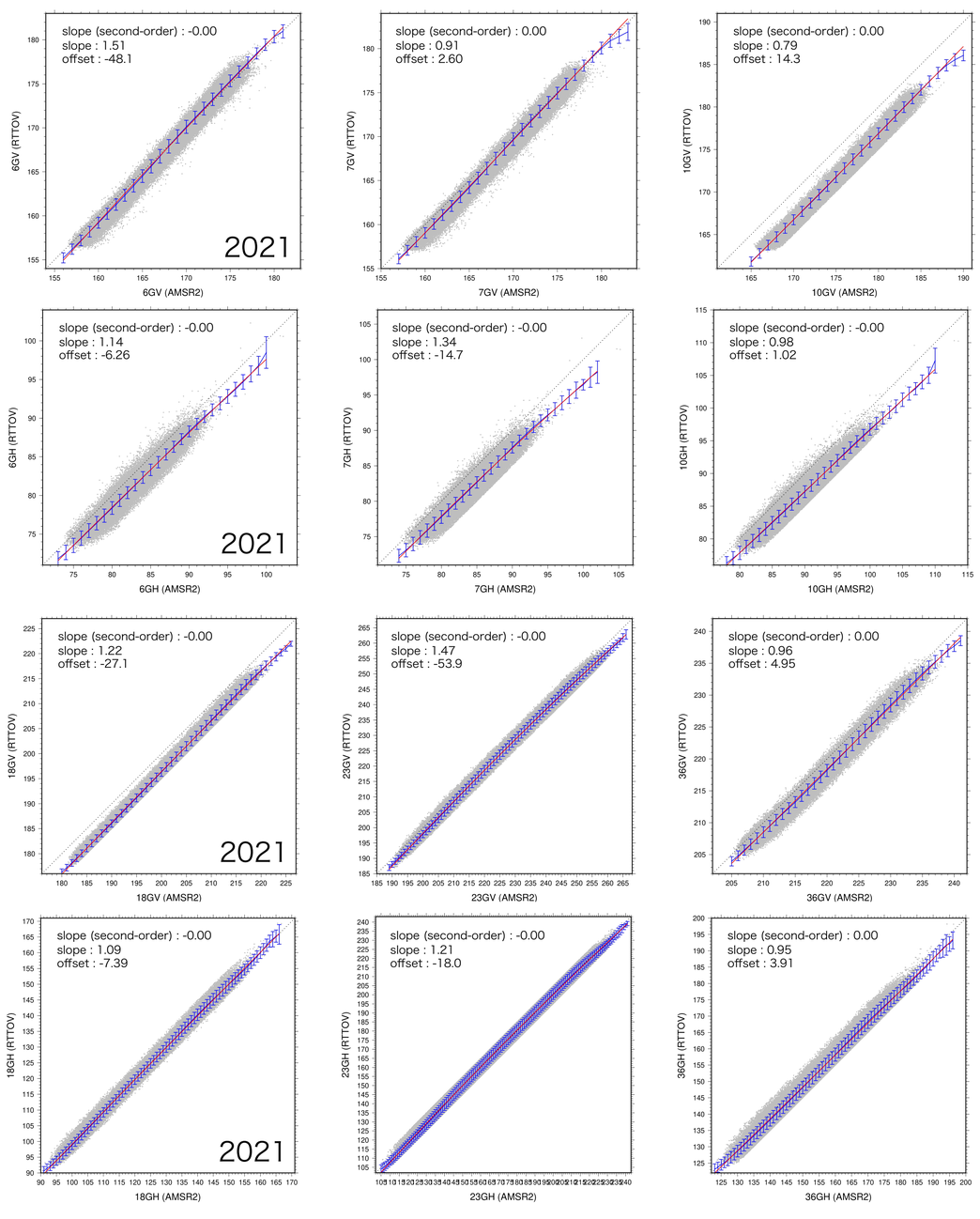


Figure 1

3. Validation

For validation, we retrieved SSTs and compared them with buoy data.

Figures 3 and 4 show the frequency of the determination residual (chi-square values) and the statistics derived by the comparison. Both chi-squares and statistics were improved by re-calibration.

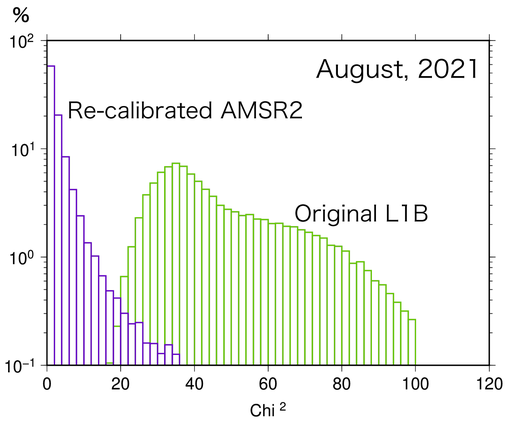


Figure 3. Chi-square value

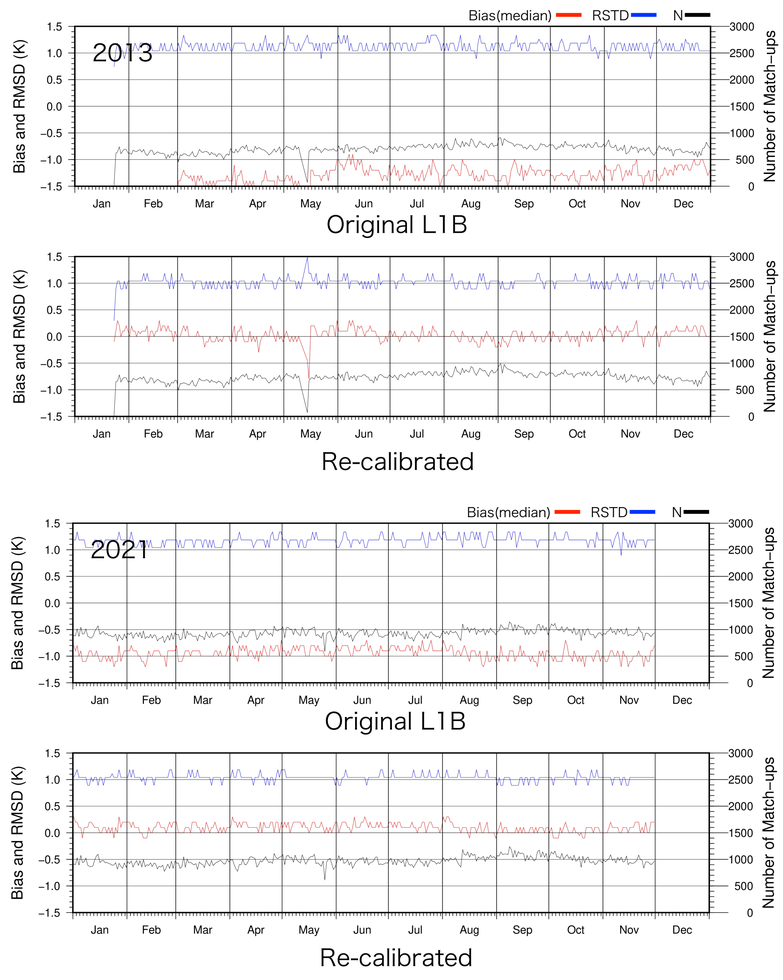


Figure 4. AMSR2 SST vs. buoy data

4. Future plan

1. Improve RTM-based re-calibration.
2. Improve the physics-based SST method.

Reference:
[1] Y. Kurihara, H. Murakami, K. Ogata, and M. Kachi, "A quasi-physical sea surface temperature method for the split-window data from the Second-generation Global Imager (SGLI) onboard the Global Change Observation Mission-Climate (GCOM-C) satellite," Remote Sensing of Environment, vol. 257, p. 112347, 2021. [Online].