AMT 2013-215
Title: Introduction to the in orbit test and its performance of the first meteorological imager of the Communication, Ocean, and Meteorological Satellite

Reply to Referee #2

We really appreciate the editor's efforts and acknowledge referee for their constructive comments and suggestions which led to substantial improvements. In the followings, the issues raised by the referee are addressed point-by-point in the order they are asked. The referee' comments are shown in italic; the authors' reply is shown in red.

Anonymous Referee #2
Received and published: 22 February 2014

General comments:
In this article in-orbit test results for the COMS satellite mission is documented demonstrating the functional and radiometric performance. It has been concluded that payload performs as expected, and within the specifications. This could be a good scientific research paper. Unfortunately, the authors have failed to deliver the scientific message, and as such, this article is not publishable it it's current form. The article seriously lacks a clear objective, in which the scientific discussion should be based.

General Responses:
The intended main objective of this paper is, as a matter of fact, to introduce a new capability of geostationary meteorological observation available in East Asia region and we thought it would become a very nice introduction if we provide the test results obtained during the in orbit test. Along with the introduction of the new capability, documenting IOT processes (which are not generally available in the public domain) in the open literature would also benefit many interested audiences, including people actually involved in the space development, data users, and who plans to follow the track.

On the other hand, as recommended by the referee, a lengthy introduction and explanation of the instrument and IOT process could lose the scientific interests that the manuscript should carry. Thus, firstly, we reorganized the manuscript using the Appendix which collects the technical aspects of the instrument, IOT processes, and some results from the functional tests. Secondly, the data acquired during IOT is reprocessed to extend the analysis of the radiometric performance and to check any significant short-term variability, long-term stability, and any significant diurnal variability, as suggested by the referee. In conclusion, thanks to the referee's comments, we could have a chance to revisit the important data acquired during the IOT and drew several new important conclusions. For example, as shown below, the overall NEdT values of the infrared channels are slightly different from the reported value which is obtained from the limited number of time periods. Also from the long-term data, at least during the IOT period, the radiometric performance does not show any significant fluctuations or drift. Specifics are exemplified below and in the updated manuscript.

Having said that, it is unclear to this reviewer, what is the main goal of this article?

Please refer the response given to the general comments

What is something novel in this article in terms of scientific orbit test analysis?

Well, IOT of a new instrument launched into space follows predefined and quite normal engineering procedures. However, thanks to the referee's comment, the radiometric performance has been tested using the reprocessed data acquired during the IOT period, which provides much more confidence in the overall performance, long-term stability, and diurnal variation of the instrument characteristics. I am not sure how many IOT test results provide the performance characteristics during the whole time period of IOT.

What other studies have been conducted in the area, and how they relate to this study?

As far as we are aware of, whenever the new instruments onboard U.S. GOES series satellite are launched into the space, they are undergoing a well established IOT procedures and the results are documented as a formal report and published such as referred in our manuscript. Other than that, many of IOT results for new instruments are presumably prepared and used within the stakeholders, although they are not usually available in public. Thus, we try to compare our results as much as possible with the publicly available studies.

All these fundamental points are missing in this manuscript, and lack a serious scientific value to be published in AMT. I understand that in-orbit test results are reported in this article. Nevertheless, they are documented like a report, and without enough scientific justification. Given this reasoning, I would like to see a complete revisit of the paper, with incorporating sufficient scientific research and discussions. The paper might be suitable for a short communication or letter, but not for a full research article, at least at this stage.

Reflecting the comments, we reprocessed all of the relevant data obtained during the IOT and reassessed the radiometric performance. Thanks to the reprocess, we could find out that the radiometric performance characterized by data obtained during a limited time period could be different from the long-term average. For your reference, a newly analyzed NEdT value using the reprocessed data is compared below (numbers in parenthesis is the new number). The new values again confirm that the overall performance is within the user requirement, although the performance in the WV, IR1, and IR2 is much better than the numbers obtained from the specific time period used for the original performance evaluation. However, the new NEdT for the SWIR channel is slightly worse than that of the original value. Again, the overall improvements in the NEdT performance are thought to be due to the spacecraft design which removes the solar panel at the side where the instrument is located.

Band	Detector	220 K		300 K	
		Measurement	Requirement	Measurement	Requirement
SWIR	A	2.80 (3.08)	5.70	0.07 (0.09)	0.10
	B	2.33 (3.04)		0.07 (0.08)	
WV	A	0.40 (0.27)	0.86	0.08 (0.04)	0.12
	B	0.37 (0.28)		0.06 (0.04)	
IR1	A	0.13 (0.01)	0.40	0.06 (0.02)	0.12
	B	0.14 (0.03)		0.04 (0.02)	
IR2	A	0.23 (0.16)	0.48	0.11 (0.05)	0.20

	B	0.23 (0.15)		0.12 (0.05)	

I am not rejecting this paper, and would like to give the authors a chance to revise the article for re-review.

Well, we feel more comfortable with the revision

Specific comments:
Here are some of the major comments/suggestions:

The paper started like a report. I am really surprised to see that there is not a single citation/reference in Introduction section! What is the goal of this article? What the authors are up to in this scientific article? Why this study is conducted? Rather than reporting the IOT results, what is something new? As a reader, I am missing all these information. Even the results presented in the article are not presented in an interesting way.

Well, as mentioned in the general response, the main goal is to report a new capability of geostationary meteorological satellite with well characterized instrument in the Asia Pacific region. With that in mind as the most important goal, we may have hurried to report the concluding numbers only. Agreed upon the referee's comments, we reorganized the manuscript and conducted much more analysis of the important data obtained during IOT period. Also, we try to include some relevant reference documents for the introduction, such as;

Goldberg, M., G. Ohring, J. Butler, C. Cao, R. Datla, D. Doelling, V. Gaertner, T. Hewison, B. Iacovazzi, D. Kim, T. Kurino, J. Lafeuille, P. Minnis, D. Renaut, J. Schmetz, D. Tobin, L. Wang, F. Weng, X. Wu, F. Yu, P. Zhang and T. Zhu: The global space-based inter-calibration system (GSICS)," Bull. Am. Meteorol. Soc, 92(4), 468-475, 2011

Hewison, T.J., X. Wu, F. Yu, Y. Tahara, X. Hu, D. Kim, and M. König: GSICS inter-calibration of infrared channels of geostationary imagers using Metop/IASI, IEEE Trans. Geosci. Remote Sens., 51(3), 1160-1170, 2013

The only fruit of this article, I can see, seems the results of SNR, NEDT, and pixel-to-pixel non-uniformity. So, please blow this up. Please stretch out enough scientific thought to demonstrate the results. The authors may include some simulation results or sensitivity test, to make the paper readable and interesting.

Thank you. We expanded the radiometric performance section to include time series analysis, day to night radiometric performance results and give more scientific interests. However, I don't see how we could incorporate the simulation and sensitivity tests for the in orbit test? This is not a kind of inter-comparison study which might involve comparison between two dataset have common target. This is the test conducted done on the instrument level. As shown in the manuscript, all the performance data is derived from the signal or digital count obtained when the instrument is looking at blackbody (which is known) and space (which has nothing interested).

Section 2 seems unnecessarily long. Is it really necessary to provide such long technical

history for the COMS/MI? May be for a technical report, but not in a research article. Section 3 also reads like a technical report. Please summarize this section. What messages are you trying to deliver to the readers? You really don't need to give all those historical details. Please be specific.

As mentioned in the general response, we would like to document the first instrument used in Korea and we thought it would be a very nice introduction if we provide the test results obtained during IOT. Along with the introduction of the new capability, documenting the IOT processes in the open literature would benefit many interested audiences. Nevertheless, those items are reorganized to Appendix for those who are interested in these subjects. Appendix is composed of three sessions: A.1 COMS/MI. A.2 Outgassing operation and A.3 Functional performance of COMS/MI during IOT period.

Previous sections are not well organized, and this is impacting on the results and discussions section as well (Section 4). The authors have shown some preliminary images. Okay. But, sometimes, I have felt that they are unnecessary, and completely random in nature.

Well, those images are worth to be recorded somehow, as they are the first images obtained by a first geostationary meteorological satellite, which are not easily accessible from the public domain, either. Now the number of Figure is changed to Figure A1 as the 'COMS/MI' session is moved to Appendix A1.

The radiometric performance section in Section 4.2. This section can be significantly improved and enhanced. The authors may include some time series results. The COMS satellite is launched in 2010. So, the authors must have enough radiometric data to go for a good scientific analysis and discussion. Are the radiometric performances consistent, or they vary from time-to-time, year-to-year? This section could be interesting, and should be extended, aligned to the topic. Please try to keep the paper more research oriented, with some scientific thought. This is seriously missing in this manuscript.

Thank you very much for the comments. In normal situation, actually this should be the main part of IOT paper. However, as mentioned before, we thought introducing the new capability is more important and this part is not properly dealt with. However, with the comments, we did expand Section 4.2 (Session 3.1 and 3.2 in revised version of manuscript) to include time series analysis, day to night performance results, and so on (Figure 3-5). On the other hand, this manuscript is for the IOT test. We probably could extend the study period after commissioning of the satellite and are preparing a manuscript reporting the results of long-term monitoring using the well-known GSICS approach. This will be published in a separate paper.

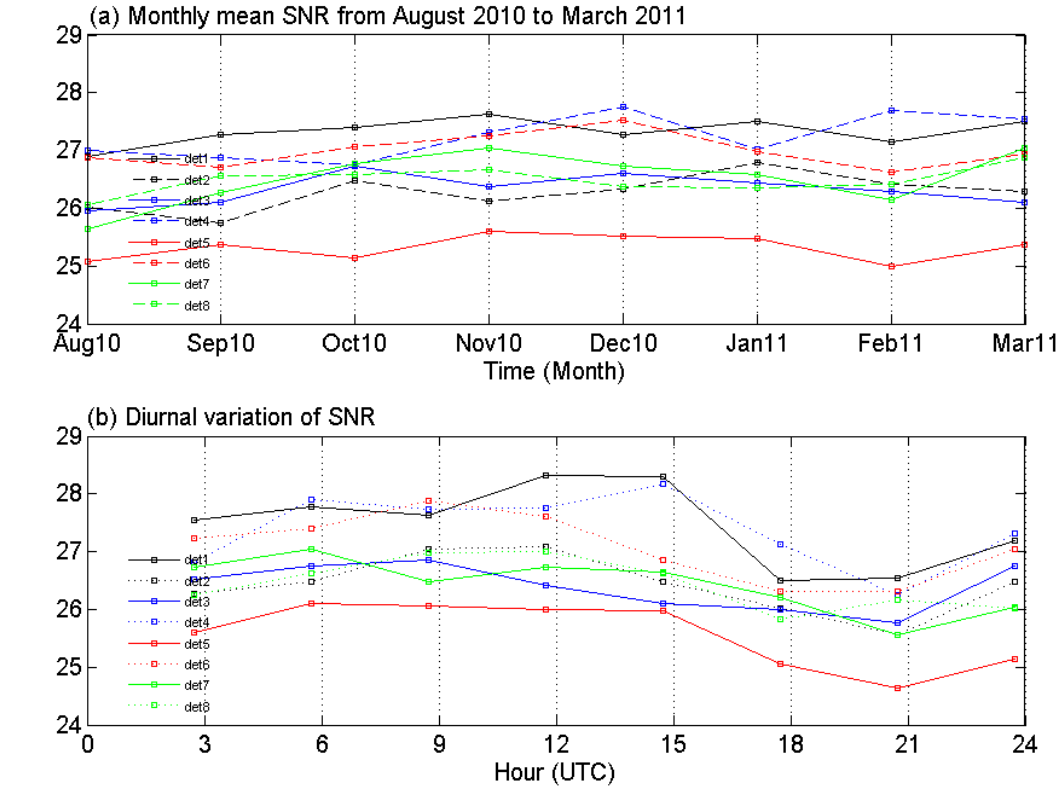

Figure 3. Time series of SNR of visible channels. (a) Monthly mean SNR of 8 detectors from August 2010 to March 2011. (b) Diurnal variation of SNR for Full Disk images (every 3 hour interval of measuremnet schedule for COMS/MI).

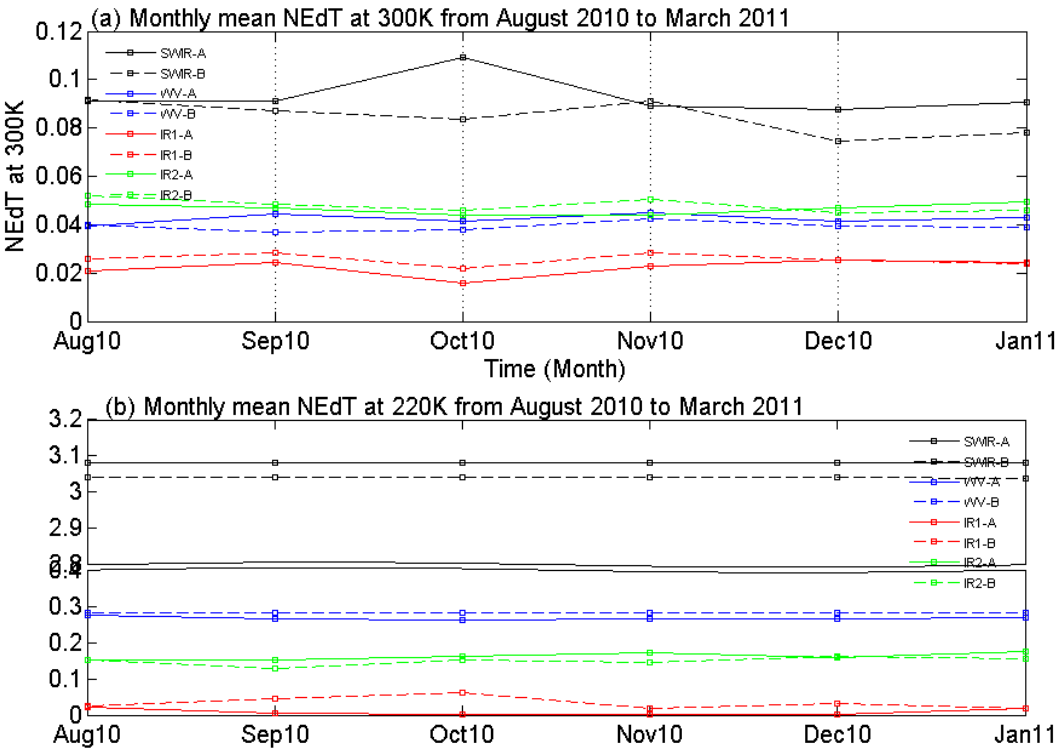

Figure 4. Monthly mean NEdT at 300K(a) and 220K(b) for 4 IR channels from August 2010 to January 2011.

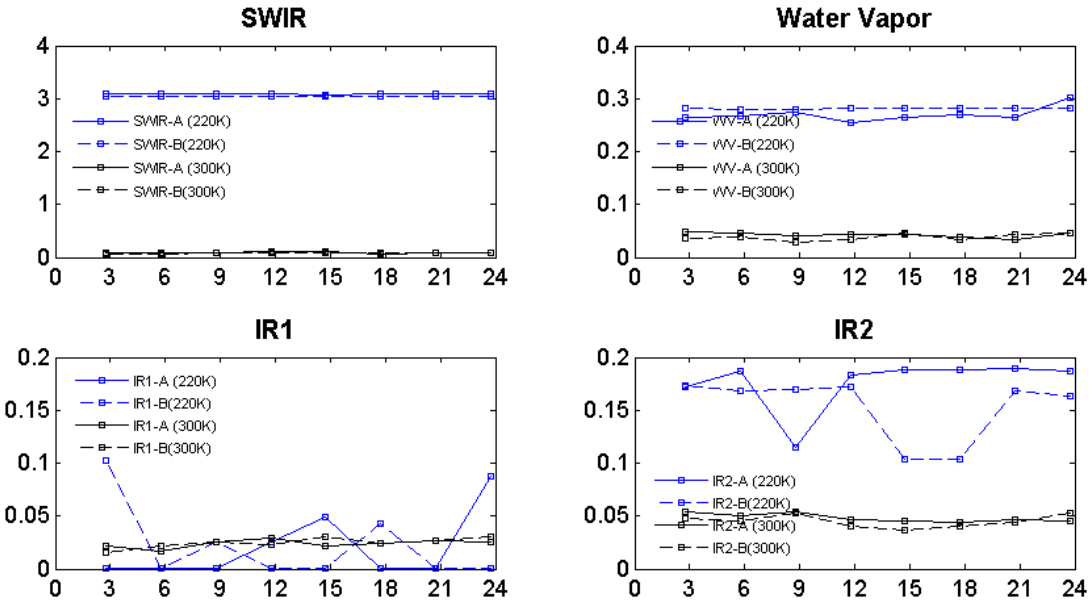

Figure 5. Diurnal variation of NEdT at 300K and 220K of 4 IR channels for each detector in the channel. Every 3 hour interval data of Full Disk images in January 2011 are used.

It would be interesting to include some radiative transfer simulation results, to make the paper publishable. How the IOT results would compare with those could be obtained in simulation?

I don't see how you could compare the radiometric performance (which is based on the space look signal) with the radiative transfer simulation (which is the theoretical signal expected when you are looking at the earth or meaningful target)