Point by Point Response to RC2

The reviews of our manuscript are thorough and well-considered. We would like to thank the reviewer for his/her careful reading and valuable comments to help us to improve this article. All the suggestions and comments from Referee 2 are addressed below point by point in bold text, followed by our responses in non-bold text. The corresponding revisions to the manuscript are marked in red. All updates to the original submission are tracked in the revised manuscript.

As the first hyperspectral infrared sounder onboard geostationary platform, GIIRS's measurements will be significantly benefit to the local NWP prediction as well as temperature and humidity profile retrievals, which are mainly guaranteed by its high quality spectrum, particularly some nonlinearity correction (NL) processing upon its observations with enough accuracy. To overcome the shortcomings of the traditional NL one, a new approach dealing with the NL correction of GIIRS is proposed where both the NL parameter μ and an iterative algorithm are established with a better performance. In my opinion, such a paper can be accepted for publication before several minor issues are clarified.

<u>Comment 01:</u> Please supply the apodization characteristics of GIIRS measurements for both FY-4A and FY-4B satellites in Table 1.

Response 01: This comment has been adopted by the authors. The apodization function is not applied to GIIRS for nether FY-4A nor FY-4B satellites. In addition, in order to make it convenient for users to do apodization processing, two channels of data are added to FY-4B/GIIRS L1 products on both sides of each band.

The supplements have been modified in Table 1 of the original manuscript. Please refer to Table 1 in lines 47-48 of section 1 of the revised manuscript.

Table 1. Main Specifications of LWIR and MWIR bands for GIIRS onboard FY-4A/B satellites

Satellite	FY-4A	FY-4B
Spectral Range	LWIR: 700-1130 cm^{-1} MWIR: 1650-2250 cm^{-1}	LWIR: 680-1130 cm^{-1} MWIR: 1650-2250 cm^{-1}
Spectral Resolution	0.625cm^{-1}	0.625cm^{-1}
Spectral Channels	LWIR: 689 MWIR: 961	LWIR: 721 MWIR: 961
Number of Detectors	128: 32×4	128: 16×8
Spatial Resolution (@nadir)	LWIR/MWIR: 16 Km	LWIR/MWIR: 12 Km
Sensitivity ($mW\cdot m^{-2}\cdot sr\cdot cm^{-2}$)	LWIR: 0.5-1.1 MWIR: 0.1-0.14	LWIR: <0.5 MWIR: <0.1
Radiometric Calibration accuracy	1.5 K	0.7 K
Spectral Calibration accuracy	10 ppm	10 ppm
Apodization characteristics	No apodization	No apodization

Comment 02: In table 2, the principles of NL correction for different sensors should be clarified more clearly.

Response 02: This comment is helpful and has been adopted by the authors. The principle of NL correction for a hyperspectral infrared FTS is to evaluate and correct the NL of target spectrum according to its out-of-band artifacts in the low-frequency caused by NL. Meanwhile, the principles of NL correction for the wide-band infrared sensor and the microwave sensor are similar, measuring and correcting NL characteristics of a sensor during its calibration procedure, where the calculation of the linear and NL coefficients is mainly based on the mathematical form of calibration in radiance or BT with DNs measured by a sensor.

The supplements have been modified in Table 2 of the original manuscript. Please refer to Table 2 in lines 90-91 of section 1 of the revised manuscript.

Table 2. Comparison of NL correction methods for different types of sensors.

Sensor Type	Hyperspectral Infrared FTS	Wide-band Infrared Sensor	Microwave Sensor
Principle	Evaluate and correct the NL of target spectrum according to its out-of-band artifacts in the low-frequency caused by NL	Measure NL characteristics of sensor and correct them in calibration procedure. Calculate the linear and NL coefficients mainly based on the mathematical form of calibration in radiance or BT with DNs measured by a sensor.	
Application	The interferogram is corrected by NL coefficient and then transferred into spectrum, which behaves linear relationship with radiance.	The NL coefficient is obtained with laboratory calibration and considered to be constant in-orbit, while the linear coefficient is achieved by two-point calibration method.	Both the linear and the NL coefficients are determined by using the NL parameter calculated during laboratory calibration as well as the linear coefficient calculated by two-point calibration method.

Comment 03: Please provide the physical meaning or explanation of NL parameter μ in the new method in detail.

Response 03: This comment is good and has been adopted by the authors. The NL parameter μ describes the NL characteristic of a sensor itself. It denotes the relationship between the linear and NL coefficients obtained from the contribution of the linear and NL parts to the whole radiometric response of a sensor, representing the shape feature of the NL curve unrelated to radiance from targets, which is ordinarily independent of different working conditions of a sensor in theory.

The above contents have been supplemented in the original manuscript. Please refer to lines 212-215 in section 2.2.3 of the revised manuscript.

Comment 04: In figure 8(b), the NL coefficients (a_2) for marginal detectors are generally smaller than those near the central of field-of-view, please analyze the possible reasons.

Response 04: This comment is constructive and has been carefully considered by the authors. More analyzed results are provided in the revised manuscript. In figure 8(b), the values of NL coefficient (a_2) for marginal detectors are generally smaller than those near the central of field-of-view by about 50%, the main reason of which is possibly caused by the overestimated linearity coefficients of the marginal ones due to the smaller incident radiation, making the estimated value of the linear part too large and further leading to the calculated one of the NL part much smaller than the actual one (namely the significant smaller NL coefficients).

The above contents have been supplemented in the original manuscript. Please refer to lines 352-359 in section 3.2.2 of the revised manuscript.