Answer to referee RC1

Dear referee, many thanks for the constructive comments and useful technical corrections. The responses are given below.

1. general comments

This paper outlines very well the strategy used to develop a lunar irradiance model from new ground-based measurements obtained from a high altitude location, as aneed shown from literature overview to develop an SI-traceable absolute irradiance model of the Moon.

LIME, the Lunar Irradiance Model of the European Space Agency, is a new lunar irradiance model developed from ground-based observations acquired using a lunarphotometer operating from the Izaña Atmospheric Observatory and Teide Peak, perfect sites for such measurements. A key attribute of the LIME model is a rigorousuncertainty analysis and the ambitious target of a sub-2% uncertainty in the resultant model as it is fi nally proved by this study.

This new model is expected to play an important role on EO radiometric calibration, which can be validated using radiometrically stable natural targets, like the lunardisk irradiance. With this information, Earth Observation measurements can be radiometrically linked to all past, present and future sensors having performed similarmeasurements.

Strategy for extraterrestrial Moon irradiance retrieval is described and easy to follow., along with the calibration. The linearity of the measurements with CIMELphotometer is tested. Also the thermal sensitivity of the instrument and the irradiance responsivity of each lunar photometer spectral channel were assessed. Rigorousuncertainty analysis of the calibration was performed, sources of uncertainty for individual lunar observations were correctly identifi ed and assessed.

The LIME model as derived from the lunar irradiance measurements from the Cimel photometer is fully described. LIME basically improves ROLO model by using anindependent set of C-coeffi cients for each spectral band of the model, calculated using diff erent steps in the procedure (Figure 8 in the article).

A refl ectance spectrum of the Moon is used to increase the model spectral resolution.

The LIME model outputs have been compared with the satellite spectral imagers PROBA-V and PLEIADES-HR-1B but considering the limitations of such comparisons.Procedure nicely and clear described and also represented in Figure 11

The manuscript is overall well written and addresses globally relevant issues.

2. specific comments

This paper is a response to a need related to the calibration of Earth observation sensors (to ensure the continuity of long-term and global climate records) and especially important for satellite sensors, calibrated prior to launch because their susceptibility to degradation in space.

I think the authors should add a short paragraph in the conclusions related to availability of LIME to be used by other interested parties.

Indeed we are working in a web tool with open access for the scientific community to run LIME and use it for research purposes. The tool is not ready yet but could be released before the end of 2023.

We have added the following sentence: “The European Space Agency plans to provide an open web tool for the LIME model to be used for research purposes.”

3.technical corrections

You are using VITO in the abstract- Please consider to write the name of the Institute here in parenthesis

Done.

Line 465- equation 15- please use subscript for 3 and 4 of the coeffi cients “p3” and “p4”

Done

Figure 8- please change Pico Teide with the English version-Peak Teide –

Done

Line 519 (page 25) please write “six values of S...” instead of “6 values of S...”

Done.

Equation no.20 (page 33) Please make the correction: for fi tting coeffi cient “a4”- 4 should be subscript

Done.

In Figure 14- for a better visualisation in the graph the authors should consider black color for 440 nm or 1020 nm (since now it could be diffi cult to distinguishbetween the two)

Done.