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Atmospheric Measurement Techniques Discussions

Interactive comment on "Metrology of the Solar Spectral Irradiance at the Top Of Atmosphere in the Near Infrared Measured at Mauna Loa Observatory: The PYR-ILIOS campaign" *by* Nuno Pereira et al.

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The authors acknowledge the valuable comments of the referee. The Toledano reference, unknown to us, comes in very useful. Regarding the comments on the stability of the detector, some of the issues raised have been clarified in the text. Minor comments

Signal to noise is not a source of uncertainty per se. It is a quantity intrinsic to the spectrometer (entrance optics + light dispersing system + detection), determined in laboratory and used as a look-up-table for the uncertainty of a measured signal given

its intensity. As the use of SNR for uncertainty calculation could be confusing we opted to remove the reference to SNR and update figure A1 to plot uncertainty instead. There was no application of sampling increasing for signal to noise reduction.

Non linearity issues: the inverse square law was verified in laboratory; this is stated in new section 2.5

The flat-field of the instrument was measured during the ground based campaign at MLO. The telescope was interfaced with the sun tracker body through an angular fine-tuning mechanism; this allowed us to establish a precise parallelism between the sun tracker detector and telescope sun-facing surfaces. This mechanism permitted to precisely depoint the telescope relative to the solar tracker and thus the Sun for a series of angles, for two perpendicular directions. The results are shown in Figure 1 of this document. Green and blue markers represent the two perpendicular directions of depointing. The dashed lines represent the Sun tracking accuracy, < 0.01°, provided by the manufacturer. The response of the detector is flat within these limits as shown by both curves.

The temperature sensitivity of the spectrometer was thoroughly determined in laboratory as referred in Bolsée 2014 (sec 2.2.3). Due to logistics constraints, during the Izaña campaign the spectrometer had to be placed outdoors. Its temperature reached occasionally 40°C (nominal temperature set point is 24.7 °C), requiring a considerable corrections to the signal. The situation was different during the campaign at MLO: the spectrometer was placed indoors and its temperature was constant within 0.1°C. Referred in section 2.5

Regarding detector stability on diurnal time scales, this monitoring is not feasible. Detector response is monitored every week as explained in section 2.5.

A table listing the individual uncertainty is now included at the end of section 3.5.

Air masses were calculated using the Schmid and Wehrli approach; however this wasn't explained but it is now the case in the section 2.2.. Also, their method to estimate the uncertainty in the AMF calculation is now included in the new section 3.5. (Estimation of air mass factors uncertainties).

We now explain at the beginning of the second paragraph that the discussion dedicated to the NIR SSI debate is not closed. A sentence has been added proposing a solution to understanding the discrepancies observed between PYR-ILIOS and IRSPERAD.

Toledano 2018 reference added.

Technical comments and corrections P1,l16: Reference now showing correctly P1,l17: Corrected P2,l16: Reference inserted P3,l15: Corrected 2 occurrences P3,eq1: Corrected P4,l5-8: In order to avoid confusion w.r.t. to the applicability of Langley-plot to gas absorbing spectral regions, sec 2.2. was rewritten. P4,l24: Done P4,l26: Reference added. This comment is particularly valuable due to the fact that the meaningful distance to be considered here is the effective distance between the blackbody and the optical centre of the telescope. This distance is a sum of two different distances each determined with different uncertainties. P5,l22-24: Done P6,l7: Done P7, fig2: This is already the case. The combined uncertainty is represented by u(I0). To make this clearer, caption was updated accordingly. P8, l16-17: The uncertainty on the relative calibration factor, K, is obtained by applying LPU to eq. 5, with each lamp having its own independent uncertainty on the measured signal. On lines 10 and 11 is only mentioned that LPU was applied to I. This could cause misunderstanding and was updated to state that LPU is applied to all the factors in eq 7. The last sentence was deleted in order to clarify the text. P9, l23: Done P8, Sec.3.3: The answer to the first remark is included in the 2nd minor comment. Although not referred in text, the solar zenith angle calculated with Meeus [1998] algorithm was corrected for atmospheric refraction, according to Bennet [1982]. This is now stated in the text. P9, l23: Done P9, l21-28: The objective of this campaign was to provide a new input dataset for the solar TOA NIR level. As a rerun of the campaign of 2011 performed with the same instrumentation, the first sentences of Results are naturally dedicated to comparing IRSPERAD and

PYR-ILIOS. The choice of SOLSPEC-ISS(IR) is to facilitate the comparison between all the datasets. It would be a priori more suitable to choose PYR-ILIOS as reference, however its limited spectral coverage would weaken the analysis between space borne datasets. Results was slightly rewritten to increase clearness. P10, fig3: shaded areas represent 1-sigma uncertainties; caption updated P10, l2: Done P10, l8: Done P15, fig A1: We understand that the way that the concept of SNR was introduced could lead to confusion on the understanding on how the uncertainty on the signal is determined. Section 3.1 was rewritten and Fig A1 converted to uncertainty as a function of the signal. P16, caption: Done P7, Tab.A1: corrected

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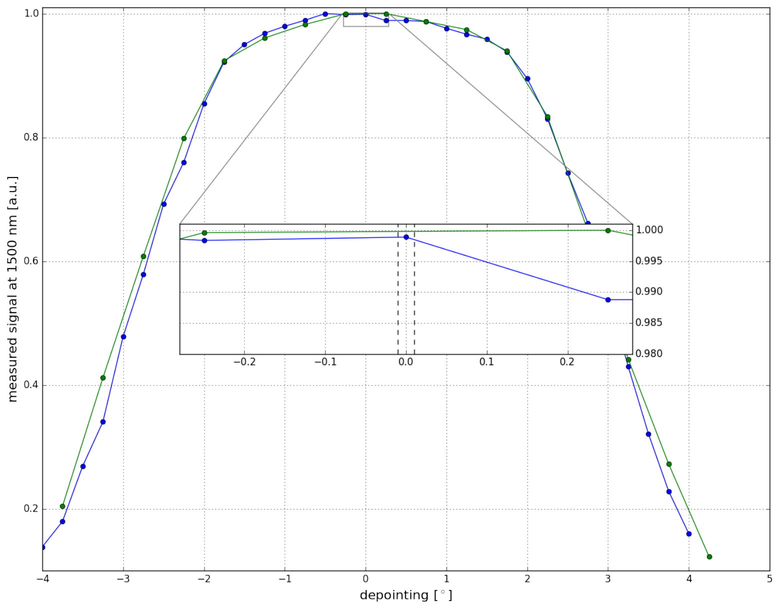

Fig. 1.