

# ***Interactive comment on “Compatibility of different measurement techniques. Long-term global solar radiation observations at Izaña Observatory” by Rosa Delia García et al.***

**Anonymous Referee #2**

Received and published: 6 December 2016

The study presents an inter-comparison of different measurement techniques of global solar radiation. The authors demonstrate consistency and analyze uncertainties between the measurements by old and modern instruments using one year (July 2014 to July 2015) of simultaneous observations at the high altitude Izaña Atmospheric Observatory, Tenerife, Spain. The uncertainties were analyzed as a function of different seasons, intensity of solar irradiance, ambient temperature, relative humidity (RH), aerosol optical depth (AOD), and solar zenith angle (SZA). The obtained results are then applied for validation of a long-term data series started in 1977. This is an interesting study on compatibility of different measurement techniques that also has an application of extending the global solar radiation time series. However, while graphical

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presentation of the results is quite clear, I found that the text of the manuscript might be improved prior the possible publication in AMT. In particular the "Introduction" and "Results" sections need more work. I think that the authors could spend more efforts on revision of the text, clarity and completeness of the presentation. Below please find my general and specific comments.

1. The authors claim to analyze performance of the measurements as a function of AOD, but I think that observations in this high altitude ( $\sim 2400$  m a.s.l.) atmospheric observatory does not appropriate for this type of analysis. The range of the AOD variability is very small and the site is characterized by very low atmospheric aerosol loading. In fact, 67 % of the observations are for  $\text{AOD}(500\text{nm}) < 0.03$ . Only 5 observations correspond to  $\text{AOD} > 0.6$ , and I suspect these observations are from a couple of consequent days and belonging to the same aerosol event (probably a case of dust transport). Therefore, the conclusions derived regarding compatibility of different measurement techniques under varying aerosol conditions maybe not solid enough.
2. Inter-comparison of the measurement techniques is also presented as a function of seasons. What seasonal characteristic is expected to influence performance of the instruments? The inter-comparison is then presented as a function of temperature. I have strong impression that the results for summer months are similar to the results for temperature range of 15-20 and  $>20$  degree; same for winter and  $<10$  degree. I think that the analysis vs. seasons is redundant with the analysis vs. temperature.
3. p9, line 9 it is written: "underestimated for all sensors and instruments except for GSR MFRSR in winter and autumn". Why it could be, what is special in this case? An explanation/hypothesis?
4. The introduction section could include a review on the previous inter-comparison and compatibility works. What is similar or different/new in the suggested here study? Several references are mentioned in "Summary and conclusions" section reporting 10 and 20 % uncertainties obtained in previous studies. The authors report much lower

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uncertainties. Is it due to different measurement conditions, quality of the reference instrument? A discussion or analysis can be useful.

5. It is mentioned in the abstract that fraction of the clear sky is among the factors that were found to affect the global solar radiation. It is mentioned among such factors as temperature, RH, and SZA. While I see analysis vs. temperature, RH and SZA, it is not clear for me what the authors mean by fraction of the clear sky and where it is in the manuscript.

6. Specific comments: p1, line 12: "By comparing with ..." the sentence is not clear. P2, line 1: Should not the reference to [Stanhill and Cohen 2001] be cited separately from others and just after word "dimming"? Please check. p8, line 8: "solar irradiation" to "solar irradiance" ? p8, line 12: "July, 17 2014" to "July 17, 2014" etc. p9, line 12: "There is not dependence ..." to "There is no dependence ..." p9, line 20: "It is clear a dependence with the irradiance level, the larger BSRN GSR values the larger bias." please revise the sentence construction. p9, line 21: "A slightly dependence with ..." to "A slight dependence with ..." Section 5, in the beginning: It can facilitate the reading if some principles of the applied artificial neural networks will be shortly described in the text, instead to address the readers to the bibliography. p. 11, line 18: I think that the next sentence can be reformulated, also "goodness" does not sound in this context. "However, the intercept is significantly higher in the 1977-1991 period than in the 2014-2015 period that might be likely due to, after reinstallation a correction in the bias, to instrument cleaning and fit. The goodness of the fit is noticeable during the whole period..."

Finally, this is only a suggestion, but the authors may reconsider the title and indicate already in the first sentence that it is about measurements techniques of global solar radiation, otherwise "Compatibility of different measurement techniques." sounds too general. For example, "Compatibility of different measurement techniques of global solar radiation and application for long-term observations at Izaña Observatory"

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