

*“On the calibration and monitoring of dual-polarization radar receivers
operating at C-band using solar flux reference at S-band”*

Reply to referee 1

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1 Referee report

Solar flux measurements are very important for weather radar networks and the (dualpol) data quality. So to revisit parameterizations, that relate flux measurements at a given frequency (S-Band) to the weather radar frequency are really important. Especially if it is well known, that there are "problems" when the sun is active. The authors provide a clear and mostly well written analysis. Even though the overall improvement of the new parameterization is rather small, it highlights the necessity for high quality solar flux observation especially in Europe, where a comparable site like DRAO is missing. A question to the authors: do you apply this new formulation now as a standard to the Suisse radars?

I've made my comments in the attached manuscript. I'd suggest to check English from a native speaker (though the article is in general well written) , or to re-read it carefully. I made some suggestions along the manuscript. [*Below, we list the open questions raised by the referee in the provided PDF so we can address each one directly in the next section.*]

1. Section 2.1: Please describe the the RSTN meaurements. Are those measurements used the same way as DRAO? Usually RSTN are not considered to be high quality, or?
2. Section 3.1.: Only for the quiet Sun? Be specific here.
3. Caption of Fig. 2: The larger variability in panel b) just below 4 GHz: Are these real variation of solar flux, or are these measurement artifacts?
4. Caption Fig. 3: Is this X(F)? if yes please state here. Then this plot can be better understood.
5. Section 4.3: This is the solar differential error; which should be 2-way, if this should be the zdr offset. Please explain or elaborate this. I don't understand the "consequently"
6. Section 4.3: Is the offset really that constant in 10 years? No issues with TR-Limiter etc?

2 Reply to referee 1

We thank the anonymous referee for the encouraging comments, which we appreciate very much. Indeed, referee 1 has identified the key point: the necessity of high-quality solar flux observations in Europe. To address the opening question by the Referee: the new formulation is not yet standard for the Swiss radars; we are still continuously monitoring how the different models perform comparatively. The article mainly focuses on the basic principles and a comparison with a limited set of observations, while now we are monitoring the various models over the long term as data become available, in order to observe long-term trends with more data. We do not a priori exclude its use in future reference flux measurements.

To address the points raised by Referee 1 in the PDF, we highlighted our revisions directly in the manuscript (to be submitted later) using underlined cyan text for ease of review (~~strikethrough-red~~ indicates removed text from the previous version). Below, we respond to the questions (reported above) that require an answer.

1. We do not use RSTN data in our analysis because the EOVS data are provided already calibrated. We have clarified this point in the manuscript. The sentence on flux calibration is taken from the cited article (Shaik and Gary, 2021).
2. Tapping (2001) indeed suggests that the method is optimal for the quiet Sun; however the paradox is that the method exists because the Sun is not quiet. For this reason, we prefer not to state this explicitly in the text and instead simply report the accuracy quoted in Tapping (2001). We have nevertheless rephrased the sentence to make clear that the accuracy reported in the manuscript is taken directly from Tapping (2001), and is not a value we estimated in our work.
3. We thank the referee for this important comment. We added text to the figure caption to clarify that these variations are due to instrumental artifacts.
4. In Fig. 3b, the fitted values are not $X(F)$ but rather the values along the blue and orange lines in Fig. 3a (i.e., the two fitted models). This type of plot follows the same approach described in Wilks (2011), p. 226, Fig. 7.4-7.5.
5. We thank the referee for this comment and acknowledge that the sentence was unclear. We have rephrased the paragraph and hope that the revised text now addresses the question.
6. Thank you for the thoughtful question. Yes, the bias remains relatively constant even after replacing the TR limiters for the H and V polarizations.