Reply on RC1
Michael Frech et al.

Author comment on "Assessing and mitigating the radar – radar interference in the German C-band weather radar network" by Michael Frech et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-532-AC1, 2022

We thank the reviewer for his helpful and constructive comments which will help to improve the paper. We respond to the issues raised in point by point reply and incorporate this response in the revised manuscript.

Reviewer comment: "the definition of STD is not precise and seems to be a special product of the GAMIC signal processor. Also, the Schaper et al. 2022 preprint does not give sufficient details. In line 56 STD is defined as the standard deviation of the power using I&Q data. In Schaper et al. 2022 it is defined as a normalized standard deviation of received power. Obviously, the expected range of 0 .. 1 implies normalization. But to which value? What is “mean” STD (line 62) in this context? The authors should give more details for users not familiar with the GAMIC signal processor. I also can not follow the statement that STD app. 0.5 indicated all pulses have the same power (line 156). If in a timeseries all data have the same value, standard deviation is 0! SQI has a more common definition, it is provided by a number of signal processors, and is generally defined as the magnitude of autocorrelation lag 1 divided by autocorrelation lag 0; or simply 1 by (spectral width normalized with Nyquist interval). Assuming that Tx phase is removed from measured phase angle."

Response: STD: We operate the signal processor Enigma in a DAS ("dynamic angle syncing" mode). Radar moments are computed from the batch of received pulses that are collected for the predefined angle width (1°). The number of processed pulses depends on the antenna speed and the PRF. For a batch of pules, STD is the normalized standard deviation of the I/Q magnitude in a given range bin. The standard deviation of the I/Q power in the batch is normalized with the mean I/Q power. Pulsed interferences usually are not correlated with the radar PRF, and the standard deviation of the I/Q power magnitude is increased because the interference is expected to be not present in every single pulse. The noisiness then increases, and the SQI decreases. This is the principle idea behind the usage of STD and SQI for the interference detection.

To clarify the description, we will change "standard deviation of the power" in line 56 to "normalized standard deviation", remove the word "mean" in line 62 and add some more in depth explanation of STD in the revised version. Line 156 will be rewritten to: "In most of the scanned area, STD is at ~0.5, indicating a typical value for recorded noise. A stable weather signal usually is at STD < 0.2."

Reviewer comment: the authors should give some more explanation why the
Interferences are reduced in the case where all radars operate with the same PRF (line 187).

**Response:** We have not found a clear reason for this feature. We assume that the identical PRF settings might somehow minimize the amount of time spans that the receiving MHP radar can record the interference. Possible influencing factors are the PRFs, the maximum range set by them, and the fact that our operational scans only record the first 150 km of range. We will add a sentence in the revised manuscript stating that reason for this yet unknown.

Response to the minor comments:

Line 30: is 2 km in Fig.1
-Thank you. We will change the number from 3 to 2 in the revised manuscript

Line 41: explain PRF
-PRF (pulse repetition frequency) is already explained in line 21/22.

Line 110: receive end: MHP? Transmit end: other radars?
-Correct. We will add the short names of the respective transmitting and receiving radars in brackets.

Line 125: H_b above radar?
-H_b in this case describes the beam height over an imaginary "earth" with a starting radius of r_e (which depends on latitude, elevation and finally the radars height over ground) and the 4/3 factor. So we think "above ground" is more fitting than "above radar".

Line 154+155: better: The received power is independent from range.
-Agreed. We will change the text to your suggestion.

Line 229: refer to Table A2 for the elevations used by PCP at MHP
-Good suggestion! We will add a cross reference to the table in the revised manuscript.

Figure 10: to what does 1.4 MHz refer? Red numbers at lower left side
-The number of 0.4 µs was wrong in the figure and will be replaced by 0.8 µs in the revised version. The 1.4 MHz refers to the 3dB bandwidth of the transmitted pulse with a pulse duration of 0.8 µs.

Line 283: in Table A3 sweep 5 is at 0.5° elevation
-We will change the number in the sentence to 0.5°. For some additional info on the chosen elevations:
Sweep number 5 is indeed at 0.5° elevation. The elevation steps of 1° are chosen according to the antenna beam width (roughly 1°) at low elevation (up to 5.5°) in order to obtain a good volume sampling close to the surface. Compared to the precipitation scan, a 0.5° elevation scan may contain more clutter, but at the same time also contains valuable radar information close to the surface. The 0.8° elevation of the precipitation scan has been chosen empirically in order to provide good quantitative precipitation estimates close.
to the surface and to avoid ground clutter.