Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
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# Comment on acp-2022-610

Anonymous Referee #2

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Referee comment on "In situ microphysics observations of intense pyroconvection from a large wildfire" by David E. Kingsmill et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-610-RC2, 2022

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## Overview

This study evaluated airborne in situ and remote sensing and ground-based remote sensing measurements of wildfire-induced pyroconvection. The authors analyzed the shape and size of particles with diameters ranging from 10 um to 6 mm. They make a distinction between a penetration that appears to be primarily composed of ash (pyrometeors) and penetrations composed of a mixture of pyrometeors and hydrometeors. This manuscript does an exceptional job of relating their unique and novel results to past literature and placing it in the context of auxiliary measurements. The manuscript is also exceptionally well-written, concise, and the figures are of very high quality. I recommend this manuscript be accepted for publication upon addressing a few minor comments listed below.

## Minor Comments:

- Fig. 1b: What is the dBZe threshold used to define echo top?
- Fig. 1: panel labels (a-d) should be bigger
- Lines 292-294: I do think it is interesting that the distribution shapes of N^ and A^ are different, but can you really say anything about comparing the order-of-magnitude ranges when the units are not the same? I'm not sure that yields any relevant information.
- I understand to some degree the interpretation of TWC vs. LWC in terms of collection efficiency from the Nevzorov probes. However, lines 473-475 are a bit confusing. I don't understand why an overestimate of cloud droplet effective radius by the PVM-100 probe leads to a smaller collection efficiency. Is this a reasoning that's due to the

different techniques of PVM-100 vs. the Nevzorov probes or are you using the PVM-100 as a supplement to your conclusion? This reasoning in general could stand to be restructured as it is also hard to understand the paragraph that starts on line 480 regarding IWC without a little more context.

**Line-specific comments:**

- Line 128: Maybe mention what the native sampling resolution is
- Lines 165-167: Where did this 18 dBZe threshold come from?
- Line 212: "…and a large as…" should be "…and as large as…"
- Lines 279-280: This sentence is worded awkwardly because there is no overlap between the 2D-P and the other instruments. I would reformat the sentence to immediately imply a lack of overlap.