Response to the Reviewer #2

We really appreciate your time and effort taken to review our manuscript submitted to Atmospheric Chemistry and Physics. Thank you very much for your positive evaluation and helpful suggestions that are very useful to greatly improve our manuscript. We have revised our manuscript according to your comments as explained below. Please see the following for our point-by-point responses shown in red just below the corresponding comments shown in black. In response to the reviewers' comments, we have revised the abstract to avoid overinterpreting CPR Doppler velocity as a direct measure of air updraft velocity and to state explicitly that the most intense convective cores may be affected by Doppler-velocity folding. We also have revised Fig. 1 to make the folded-column shading and quality-control gaps clearer.

This paper analyzes strong updrafts identified in nine months of cloud-profiling radar measurements taken the EarthCARE retrievals. The paper is well written and satisfies with the journal's goal to publish work that provides new insights into atmospheric physics. One significant outcome of this paper is the ability to extend the conclusions here to data from other satellite missions, like CloudSat.

I recommend this for publication, and have minor suggestions to improve the clarity of the paper:

- L9: Stating that this data "[enables] direct constraints on convective updraft intensity" is too strong of a statement when there are several limitations to consider when we use this data. The velocity of very strong updrafts cannot be measured, for example. I suggest replacing this with something like "enabling spaceborne measurements" to emphasize the novelty of the data. Broadly, I suggest softening this statement.

We agree that the original wording was too strong because CPR Doppler velocity is a reflectivity-weighted hydrometeor Doppler velocity and because the most intense convective cores can be affected by velocity folding. We have softened the abstract to emphasize the novelty of spaceborne Doppler measurements while making the limitation explicit.

- L211-222: "Columns whose 3 km–averaged Vd profiles exhibit discrete vertical jumps with magnitudes exceeding the Nyquist velocity are flagged as folded (as described in Sect. 2.3) and are shaded in grey in Fig. 1d." Is the shading you refer to shown at CPR column index ~300 and ~500. If so, this is very hard to see, so I suggest revising this figure for clarity. The shading is also mentioned in the caption (L193).

We agree that the folded-column shading in Fig. 1d was difficult to see. We revised the figure and the caption now explicitly identifies the relevant column-index ranges.

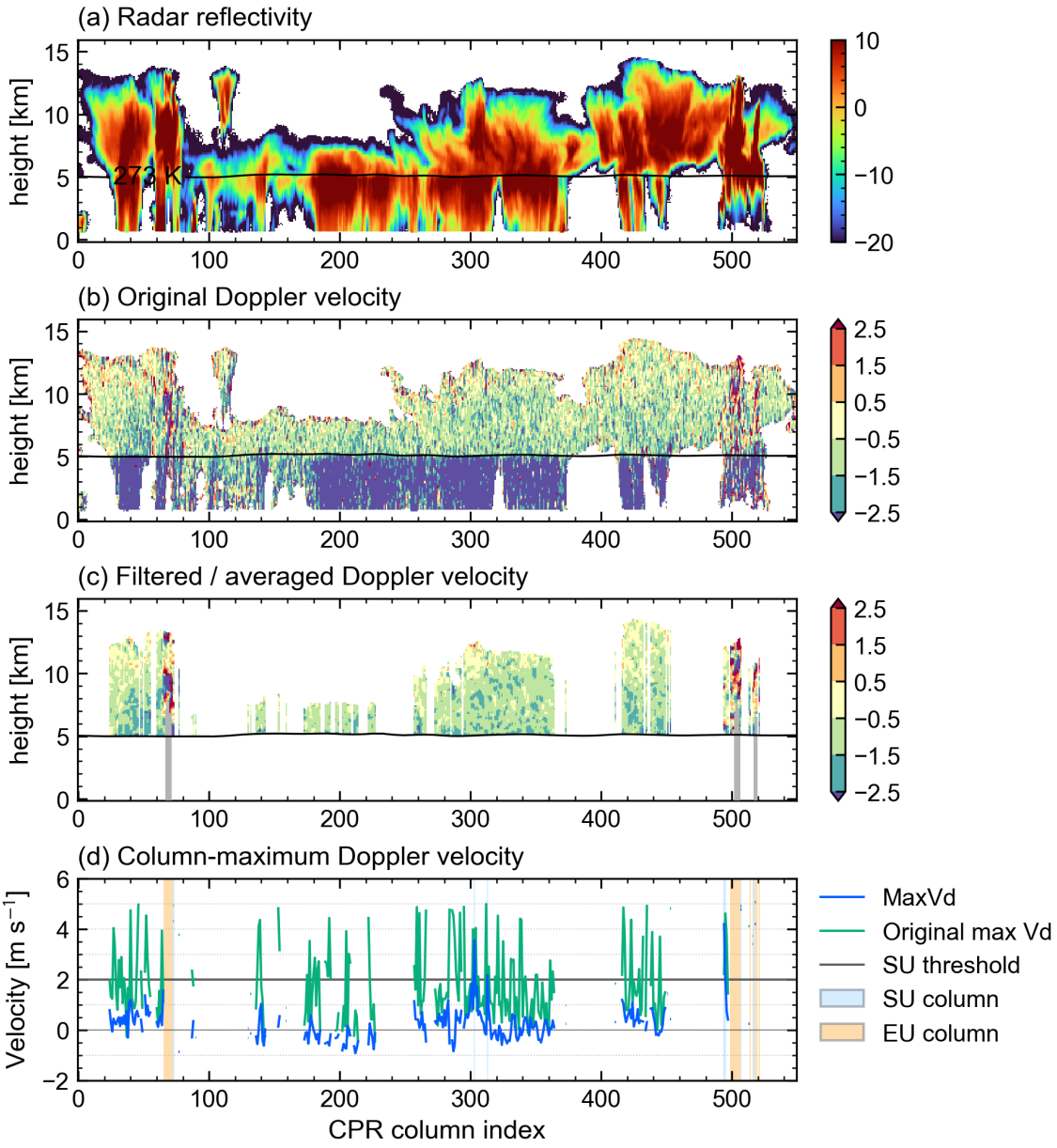

Figure 1: Example illustrating Doppler-velocity quality control, folding detection, and the definition of the updraft metric MaxVd for an EarthCARE/CPR scene. (a) Radar reflectivity factor (Ref; dBZ). (b) Input CPR_CLP Doppler velocity (Vd; m s^{-1}) after applying only the cloud-mask threshold (cloud mask ≥ 20); positive values indicate upward motion. The black line marks the 273.15 K isotherm. (c) Doppler velocity after applying the column-selection criteria and quality control. Gaps indicate columns or gates for which no valid Doppler velocity remains after column selection and quality control. Grey shading near column indices approximately 70, 500, and 510 denotes gates flagged as being affected by multiple scattering. (d) Column-maximum Doppler velocity as a function of column index, computed from the input field in (b) for visual

comparison (“Original”; green) and from the filtered and averaged field in (c) for the quantitative metric (“MaxVd”; blue). Light-orange shading denotes columns flagged as folded and classified as extreme-updraft (EU) candidate columns. Light-blue shading denotes columns with MaxVd > 2.0 m s^{-1}, classified as strong-updraft (SU) columns.

- Why does the orange quality-controlled line in Fig. 1 have points missing? Are those points flagged as Nyquist folded?

We have clarified this in the revised caption. The orange line shows the MaxVd values used for the quantitative non-folded statistics. Gaps indicate columns for which no valid Doppler velocity remains after the combined quality-control procedure, including low-confidence Doppler estimates, multiple scattering, and velocity folding. To make the figure clearer, we also restrict the “Original max Vd” line to columns with valid Doppler-velocity data, so that the difference between the two lines more directly illustrates the effects of quality control, spatial averaging, and folding detection rather than differences in column selection.

- Section 2.4 (and elsewhere). Does "non-folded" refer to samples for which convection was identified and its velocity profile passes your folding test? When there is no updraft/downdraft, is the column still non-folded? Maybe this is implied for people who work with doppler radar. Should we interpret the top panel in Fig. 2 as the distribution of MaxVd conditioned on the convection being detected and the column being non-folded?

Thank you for pointing this out. We agree that this terminology needs clarification. In the revised manuscript, “non-folded” refers to selected convective cloud columns that pass the folding test described in Sect. 2.3. It does not imply that a column necessarily contains a strong updraft; rather, it means that the column is suitable for quantitative MaxVd analysis because no fold-like discontinuity is detected in the subfreezing Doppler-velocity profile.

Accordingly, Fig. 2a should be interpreted as the distribution of MaxVd conditioned on the column being selected as a convective cloud column and not being flagged as folded. We have revised the text and caption to make this conditioning explicit.

- Fig 7a The title has a typo: Numer -> Number

Corrected. “Numer” has been changed to “Number.”