Response to Reviewer and Editor Comments

We sincerely thank the editor and the reviewers for their constructive suggestions. We have carefully addressed all comments. Our point-by-point responses are detailed below, with changes implemented in the revised manuscript highlighted accordingly.

Referee #2

Comment:

My concern has to do with the applicability of the process to natural clouds with updrafts. I feel that the authors should add a comment such as that below to the Conclusions section, first paragraph: "While both mechanisms can prolong the lifetime of mixed-phase clouds, this study intentionally excludes vertical motion to isolate the microphysical contribution of the solute effect to droplet–ice vapor competition. However, the process needs to be studied both in models and natural clouds, with updrafts."

Response: We thank the reviewer for this important suggestion. We have added the suggested sentence to the first paragraph of the conclusions section as follow:

"While both mechanisms can change the lifetime of mixed-phase clouds, this study intentionally excludes vertical motion to isolate the microphysical contribution of the solute effect to droplet–ice vapor competition. However, the process needs to be studied both in models and natural clouds, with updrafts."

Editor

- Comment (Title and Lines 13, 121, 142, 154, 197, 213, 339, 349, 352, 371):

For consistency, "mixed phase" should be "mixed-phase"

Response: All instances of "mixed phase" have been corrected to "mixed-phase" for consistency.

- Comment (Line 50):

Replace “Giant Cloud Condensation Nuclei enhanced Ice Sublimation” by “Giant Cloud Condensation Nuclei–Enhanced Ice Sublimation Process”

Response: Corrected as suggested.

- Comment (Line 83):

Should “droplets cases” be “CCN cases”?

Response: Yes, this was a misstatement. It has been corrected to “CCN cases.”

- Comment (Line 154):

Replace “small particle aerosols” by “small aerosol particles”

Response: Corrected as suggested.

- Comment (Lines 154–155):

Replace “condensation nuclei” by “CCN”

Response: Corrected as suggested.

- Comment (Line 164):

Replace “Bergeron process” by “WBF process”

Response: Corrected as suggested.

- Comment (Line 202):

Define AFLUX

Response: We have now added a definition for AFLUX: “...AFLUX (Airborne measurements of radiative and turbulent FLUXes of energy)...”

- Comment (Line 208):

Define “DLR”

Response: We have now added a definition for DLR “German Aerospace Center”.

- Comment (Lines 220, 223 and 224):

Use consistent term (HYSPLIT)

Response: All mentions have been standardized to “HYSPLIT”.

- Comment (Line 285):

Should “dry cloud droplet condensation nucleus diameter” be “dry cloud droplet CCN diameter”?

Response: Yes, and corrected as suggested.

- Comment (Lines 300, 316):

Replace “giant CCNs” by “GCCNs”

Response: All instances of “giant CCNs” have been changed to “GCCNs.”

- Comment (Line 329):

The following statement is not completely clear: “The key parameter determines in which region is how much aerosol is actually inside the droplet”

Response: Revised to: “The key parameter determining which cloud droplets participate in the WBF process or the GCCN–ISP process is the size of the CCN within each droplet...”.

- Comment (Line 334):

Define “INP”

Response: We have added the definition at first use “...INP (Ice Nucleating Particles)...”.

- Comment (Line 367):

Replace “cloud condensation nuclei” by “CCN”

Response: Corrected as suggested.