

Review report for EGUSPHERE-2025-4981

Title: Evaluation of upper-tropospheric lower-stratospheric properties over the Asian monsoon region in a storm-resolving model.

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Recommendation: Publish after minor revisions

General Comments

This manuscript presents a comprehensive evaluation of the ICON model at storm-resolving resolution (2.5 km) over the Asian Monsoon region. By using unique high-altitude in-situ measurements from the StratoClim campaign, along with additional datasets (ATTREX, POSIDON, StratoClim-2), the authors provide a valuable assessment of the model's performance in the UTLS region. The study successfully links thermodynamic biases (cold/moist UT, warm/dry LS) to microphysical outcomes (ice cloud placement) and dynamical deficiencies (weak vertical velocities and gravity wave activity). The identification of mechanisms, specifically the underrepresentation of convective overshooting and the potential role of gravity waves, adds significant scientific value.

The manuscript is well-written and logically structured. However, I have noted a few minor typos and instances where figure captions are somewhat unclear or incomplete regarding legend definitions. I recommend publication after minor revisions to address the specific points listed below.

Specific Comments

1. Page 1, line 10: The text mentions "frequencies greater than 10^3 s^{-1} ". This corresponds to 1000 Hz (acoustic range), which is physically impossible for atmospheric gravity waves. Section 3.3 correctly identifies the range as $f > 10^{-3} \text{ s}^{-1}$. Please correct the exponent in the abstract to 10^{-3} s^{-1} .
2. Page 3, line 68: The text mentions "ICON model, version 2.6.4". Please provide the citation or reference for this model version.
3. Page 3, line 86: There is a discrepancy on the latitude range of the subdomain. The text (Page 3, Line 86) states the subdomain extends from "19 to 30°N", whereas the caption of Figure 1 defines it as "20°N–30°N". Please check and ensure consistency between the text and the figure.
4. Figure 1 caption: The text describes the trajectory initiation area as a "gold" box, while the Figure 1 caption refers to it as a "yellow box". Please use consistent wording to avoid confusion.

5. Page 5, line 110: The text refers to the simulation setup as "2M00", but Table 1 lists the designation as "2M00t". Please correct the text to match the designation in the table.
6. Figure3: The caption needs revision to match the panels. Specifically in Panel c:
 - (a). It mentions "thin red lines" (which appear orange) but fails to define the solid thick red line (most likely the MLS average).
 - (b). The color for the ERA-5 reanalysis (purple) is not specified, whereas other datasets are explicitly described. For consistency, this should be added. Please change the caption for Figure 5 as well.
7. Page 9, line 170: Please change "pressure" to "pressures".
8. Page 14, line 253: There is a missing period (".") at the end of the sentence.
9. Page 14, line 269: The text says the aircraft samples "no ice clouds" at pressures greater than 160 hPa. However, Figure 9a shows a few black stars (in-situ data) in this area, which means some ice was present. Please rephrase this to be more precise. For example, use "samples negligible ice clouds" or "samples almost no ice clouds."
10. Figure 9: Please add a legend for panel (c) so the reader can understand what the lines represent.
11. Page 18, line 339 & 340 & 346: The initials used for the authors are not consistent. In "Author Contributions," they are written as "ESA" and "MK," but in "Acknowledgements," they are written as "EISA" and "MKK." Please use the same format in both sections.