

Referee Comments for the article titled “Evaluating Microphysics and Boundary Layer Schemes in WRF: Assessment of 36 Scheme Combinations for 17 Major Storms in Saudi Arabia”

The present article provides a comprehensive literature review in the field of urban meteorology, with a particular focus on the challenges and developments over Saudi-Arabia and middle-east.

The review work by Sahu Rajesh et al. (2025) is a well-prepared and valuable manuscript that provides a detailed review of evaluating microphysics and boundary layer schemes in WRF over Saudi Arabia. The authors have done an excellent job in addressing extreme rainfall events and its modelling over data sparse region like Saudi Arabia. I think that the manuscript presents a well-structured and comprehensive review with significant improvements in clarity, depth, and organization. Though the manuscript is well structured and presented, I have a very few minor comments related with the manuscript, which I feel that the authors should incorporate. The manuscript has the potential to get acceptance, only after addressing the comments below:

Major/Minor Comments

1. Consider making the title slightly more concise and catchier. For example:

“Evaluation of Microphysics and Boundary Layer Schemes for Simulating Extreme Rainfall events over Saudi Arabia using WRF”.

2. In Abstract kindly rephrase the line: “Kling-Gupta Efficiency (KGE) incorporates correlation, variability, and overall bias.”

to

“The Kling-Gupta Efficiency (KGE) metric, which incorporates correlation, variability, and bias, was used for performance evaluation.” Provide necessary (original WMO) citations for the metrics used.

3. In section 1 where you structure the ten key questions, consider using letters (a, b, c...) for questions to avoid confusion with numbered sections.

4. Ensure all acronyms (e.g., MP, BL, KGE, IMERG) are defined on their first use in both the abstract and main text.

5. Add more region-specific references: While many global references are cited, consider including more recent or specific studies on EREs or WRF performance over Saudi Arabia or the Middle East (e.g., 2022–2024 publications if available).

6. On page 2, after line number 25 rephrase the line “These events are often linked to the intrusion of intensified subtropical jet stream...” to:

“These events are frequently associated with intrusions of an intensified subtropical jet stream...”

7. Make the figure captions of Figure 2, 3 and 4 more self-explanatory by specifying metrics, datasets, and periods used.

8. In the abstract section after line number 10, “The Thompson-YSU combination yielded the highest mean KGE...”

Rephrase to “Among all 36 combinations, the Thompson-YSU pairing consistently produced the highest mean KGE across the 17 storm events.”

9. Ensure consistent use of terms like “EREs,” “events,” “storms” throughout the paper. Stick with one preferred term unless differentiation is needed.

10. After line number 285, “...models often struggle to replicate the spatial distribution of events precisely.”

Suggestion is to rephrase: “This is expected, as localized convective systems common in the region present challenges for accurately resolving spatial rainfall patterns in mesoscale models.”

11. After line number 290: “...the Goddard (MP7) and Thompson (MP8) MP schemes, particularly when paired with the YSU (BL1)..... emerged as superior.”

Rephrased to “...the Goddard (MP7) and Thompson (MP8) schemes, when combined with YSU (BL1), consistently ranked highest across both temporal and spatial KGE assessments.”

12. When discussing major findings (e.g., Thompson–YSU being best), consider referencing the figure or table that supports this claim.

13. The paper can be redrafted to explain the section 4.7 in the beginning i.e. before section 4.1. This is so that readers gets a visual demonstration of the rainfall event in the domain of the study.

14. In the conclusion section of the study bring out the motivation/conclusion of the study that this is a kind of a verification study for hydrometeorology.

15. The authors can also verify the 850hPa wind and near surface temperature and provide plots in supplementary section.