

Review of gmd-2024-201: The third Met Office Unified Model-JULES Regional Atmosphere and Land Configuration, RAL3

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Overview: The manuscript provides a comprehensive and well-structured overview of the development and evaluation of the third version of the Regional Atmosphere and Land (RAL3) configuration of the Met Office Unified Model. Key developments include the integration of new physics schemes, the unification of mid-latitude and tropical configurations, and detailed evaluations of model performance, including process-based analyses. Notable improvements over RAL2 include, among others, the introduction of a double-moment microphysics scheme (CASIM) and a bi-modal cloud scheme.

The paper is exceptionally well-crafted and fulfills its objective of informing the community about the advancements in RAL3 and its configurations. It provides a comprehensive and readable account, with detailed documentation of the system and its performance evaluations. Only minor points of clarification remain. Therefore, I recommend its publication following very minor revisions.

Specific comments

- P3L25: The sentence “While CP climate models ... with parameterized convection (Kendon et al., 2017)” is rather long. I suggest breaking it into two sentences for improved readability: “While CP climate models do not necessarily better represent daily mean precipitation (e.g., Berthou et al., 2020), they typically show improved sub-daily rainfall characteristics. These include better representation of the diurnal cycle of convection, the spatial structure of rainfall, duration-intensity characteristics, and the intensity of hourly precipitation extremes compared to climate models with parameterized convection (Kendon et al., 2017).”
- P4L6: There is a repeated word: “inform inform”
- P6, section 2.3: What is the minimum model grid spacing, the full Δz ? Is it 5 or 10 m? What is the maximum grid spacing at the model top?
- Table 1: At this point in the manuscript, it is not clear what “Murk aerosol” is. I suggest to add a reference.
- P9L11: “... and it uses a fixed in-cloud number concentration”. Of what? Aerosols? CCNs?
- P9L28: Change “so less well” to “so it is less well”.
- P12L1-4: The last sentence is not clear to me. What exactly is your statement? How can a changed diagnostic influence the behavior of the turbulence scheme?
- P17L7: “targetted” → “targeted”
- P23L18: Check the reference “P et al., 2021”, also in the references on P38.
- P28L18-L25: What is SINGV?
- Table 3: What is CLASSIC? To clarify, but “EasyAerosol” on a new line.
- Figure 6: What do the bars represent? Standard deviation? Minimum to Maximum?