To improve summer precipitation forecasts in the Taiwan Global Forecast System (TGFS), authors modified the Tiedtke cumulus parameterization with scale-aware treatments and adjusted convection constraints. These updates, including revised cloud-top definitions and increased sensitivity to humidity, effectively reduced precipitation biases and improved the accuracy of afternoon thunderstorm patterns. The manuscript is well-written and offers valuable insights for enhancing the convection parameterization scheme. I find it suitable for publication, but recommend that the authors address following points.

The authors thank Referee #2 for the positive evaluation and constructive suggestions. Our point-by-point responses are provided below and marked in blue text.

1. As the authors note, the enhanced contribution from the convection scheme consumes more environmental instability through subgrid-scale processes, resulting in the suppression of grid-scale convective updrafts and a corresponding reduction in precipitation intensity. This is clearly demonstrated by the scale-aware adjustment experiment (adj_SCA in Table 2), where a larger cloud-base mass flux increases the sub-grid scale convection and consequently reduces the overestimated total precipitation, compared to the SCA experiment (Figs. 6 and 7). Conversely, the CUP, TOP, and CRH experiments (Table 2) were intended to reduce the sub-grid scale convection intensity by extending the adjustment time scale, lowering the convective cloud top, and increasing entrainment as a function of environmental RH. These changes were expected to increase total precipitation due to reduced suppression of environmental instability. However, as the authors note, CUP, TOP, and CRH appear to further reduce the total precipitation (Fig. 6). The authors must address this inconsistency between the strength of sub-grid scale convection and the total precipitation by providing the ratio of sub-grid scale precipitation to total precipitation for the CUP, TOP, and CRH experiments, compared with the adj_SCA experiment.

   Thank you for pointing out the inconsistent effects among our different modifications to the convection schemes and recommend providing the ratio of subgrid-scale convection and total precipitation for all these experiments. Figure R2 shows that the contribution of subgrid-scale precipitation is slightly reduced in CUP and TOP compared to adj_SCA. However, this does not lead to an increase in total precipitation, likely due to the complex interaction between the convection and microphysics schemes. Although the subgrid-scale convection is relatively suppressed, the overall environmental instability may not be sufficiently favorable or efficient for the microphysics scheme to create grid-scale rainfall. The results suggest that the instability retained by the weakened subgrid-scale processes might be converted into cloud water or light stratiform rain rather than heavy precipitation. We will consider incorporating this discussion/figures in our revised manuscript. Regarding the CRH experiment, the discussion is included in our response to Comment 2.

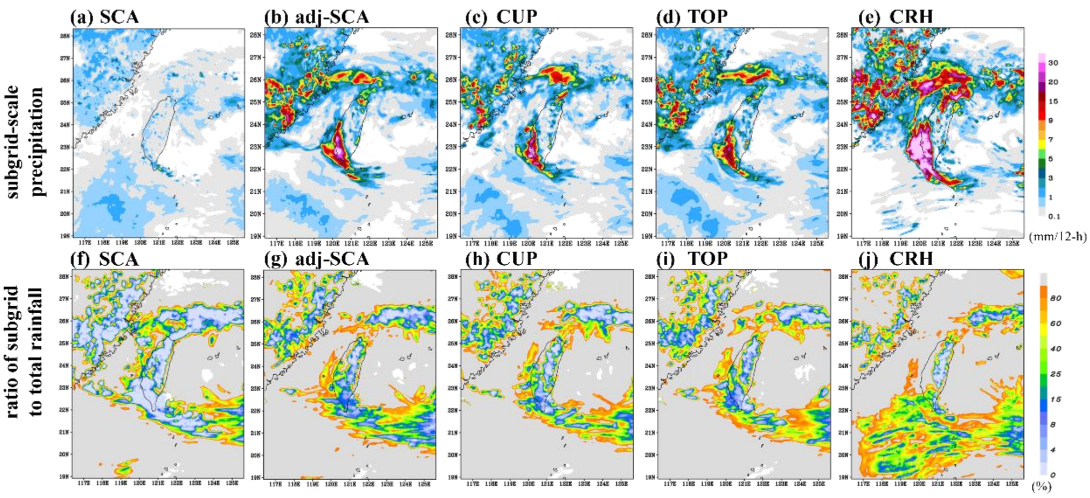

Figure R2: (a)–(e) Subgrid-scale precipitation (mm) and (f)–(j) the ratio (%) of subgrid-scale precipitation to total (subgrid + grid) precipitation from the (a), (f) SCA, (b), (g) adj-SCA , (c), (h) CUP , (d), (i) TOP and (e), (j) CRH experiments at 48–60-h forecasts.

2. Is the increased widespread light rain in the CRH mainly from the sub-grid scale precipitation or from the grid-scale precipitation? If it is mainly from the latter, the increased sub-grid scale convection intensity may help to reduce the widespread light rain. Therefore, it would be valuable for the authors to present a sensitivity analysis of the widespread light rain in response to varying sub-grid scale convection intensity.

We found that the increased widespread light precipitation in CRH is primarily attributed to the subgrid-scale precipitation, as shown in Fig. R2e, j, even though the modified convective trigger was intended to suppress the convection in lower-RH environments and thereby hopefully reduce the production of light rain. This result stems from the modifications to the entrainment and detrainment rates, where the formulations in Eqs. (3) and (4) are replaced by those in Eqs. (5) and (8). These changes lead to a greater contribution from the subgrid-scale processes. Consequently, the increased consumption of environmental instability by subgrid-scale convective processes further reduces the heavy precipitation bias associated with the grid-scale processes, but it enhances the light precipitation bias linked to the subgrid-scale processes. We will incorporate these descriptions into the relevant sections of the revised manuscript to improve clarity.