

Review Report on “Tracking the influence of cloud condensation nuclei on summer diurnal precipitating systems over complex topography in Taiwan” by Chang et al.

**General comments:**

This manuscript focuses on the effects of increasing aerosols in orographic precipitation under the weak synoptic weather regime. The statistical analysis shows that the impact of CCN on the diurnal precipitating systems are more significant in the orographic-locking regime by postponing the convective initiations, increasing the occurrence of extreme maximum rain rates, and increasing the cloud size. This study successfully untangles the CCN effects and environmental effects in the specific orographic location. I recommend a minor revision.

**Specific comments:**

1. The aerosol number concentration in the polluted scenario is two orders larger than the clean scenario. The polluted scenario comes from Taipei City, and the clean scenario is based on an oceanic situation. I assume these values are applied to the whole domain. Thus, those are the two extreme scenarios. I am curious whether the effects of CCN are also significant if a more realistic aerosol concentration is used. I suggest another simulation with aerosol number concentration as  $3 \times 10^9 \text{ kg}^{-1}$  in the supplementary material.
2. Line 268-270 and other places show the discussions about the circulations. Perhaps Figures showing the circulation can support those explanations better.
3. Figure 5 and the related text discuss the initiation time of precipitation. Based on the text, Figure 5e-h marked the region that CCN has a significant effect in delaying the convection. I think it more informative to use color to represent the delayed time.
4. Line 283-284, “We hypothesis that under the orographic-locking regime, increasing CCN could make the convective clouds have a longer time to develop, leading to stronger intensity and degree of organization.” The rest of the manuscript discusses the impacts

of CCN on the precipitation statistics and cloud depth but does not revisit the initiation time and cloud lifetime. Perhaps it is better to reword this sentence.

5. Line 270-300, the effects of CCN are more significant in the orographic-locking regime of the southern type than the northern type. Why?
6. Figure 7, it is better to add grids on the figure to better show orographic-locking regime has a higher maximum rain rate.