Review comment on “Effects of Intermittent Aerosol Forcing on the Stratocumulus-to-Cumulus Transition” by Prabhakaran et al.,

General comment:

The authors investigated the impact of injected aerosols on the transition from stratocumulus to cumulus clouds in the north-east Pacific. They revealed that aerosol injection delays the stratocumulus-to-cumulus transition, with the extent of the delay directly proportional to the number of aerosol particles injected into the marine boundary layer, ultimately influencing cloud radiative effects in both pristine and polluted systems. Overall, I suggest publishing it after addressing the comments below.

Major comments:

- Injections time are chosen to be the same stage during diurnal cycle. Why is that? How will it impact the results if injection at different time during the diurnal cycle?

Minor comments:

- Line 75: why? the deficiency with small LES domain is the lack of feedback from larger-scale, but the Lagrangian LES does not solve this problem, even the large-scale variabilities are presented by forcings. On top of that, whether forcing is good enough is a new problem.
- Line 82: recommend 1-2 sentence to clarify what does “bin-emulating, bulk microphysical model” mean.
- Line 90: “The two modes are separated by a threshold value of 25 .m in radius.” reference? It is larger than the convectional 12 or 13 micro as the start of auto-conversion. Why?
- Line 96: “In the applied modeling framework, cloud processing of aerosol affects the number concentration of aerosol but not the shape of the distribution.” Reference?

- Line 102-104: “the results are highly relevant in terms of the injection-related modification to and the subsequent adjustments of LWP and fc, which together determine the degree of Nd cloud brightening.” Besides LWP and fc, how about cloud base height, cloud top height and cloud depth?
- Line 130: “the plume”, what does the “plume” mean? Injected aerosol plume? Or cloud plume? I don’t think I understand why the authors can use aerosol concentration to represent a plume, that usually use cloud optical thickness or cloud albedo to identify. They are two quite distinguished concept. Also, does it make more sense to use na+nd to identify plume than solely na?
- Line 135-137: which figure are you referring to representing spread rate?
- Line 151-152: why? Why not separate the plume and background region?
- Line 156-158: “On day 3, decreases by about 40% by midday due to (i) collision-coalescence and precipitation losses, Nd and (ii) reduced aerosol activation rate due to the weakening of the updrafts (Fig. 3) due to precipitation evaporation and SW absorption.” Figure 3 does not updraft. Also, how do you know the activation fraction is reduced? If that is inferred, soften the sentence to reflect that.
- Line 164: remove the bracket
- Many places explain the phenomena by entrainment but there is no direct reflection of the cloud top entrainment strength. How about adding it to the figures?