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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol Characteristics in the Entrainment Interface Layer In Relation to the Marine Boundary Layer and Free Troposphere" *by* Hossein Dadashazar et al.

Anonymous Referee #2

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This paper focuses on the aerosol properties in the Entrainment Interface Layer (EIL) above marine stratocumulus cloud off the California coast during two field campaigns. EIL represents a thin and turbulent layer above the top of marine stratocumulus cloud, and separates the stratocumulus topped boundary layer (STBL) from the free troposphere (FT). The main conclusion includes that new particle formation is enhanced in the EIL, and the properties of EIL aerosol are intermediate to those in the STBL and FT (i.e., aerosol gradient in the EIL is maintained by the relative difference of aerosol characteristics between STBL and lower FT layers.) The paper is well written, and the topic is well suited for Atmospheric Chemistry and Physics. I'd like to compliment the authors on this interesting study. Following are my comments and suggestions.

(1) Table 1: PCASP showed higher concentration in EIL than those in STBL and FT in five cases. These are also among the cases when some of the highest concentrations of CN(3-10 nm) were observed. Does the highest PCASP concentration in EIL indicate a different airmass than those in STBL and FT? If so, for these cases, could the enhanced CN(3-10 nm) be a result of the different airmass instead of enhanced new particle formation? Were there any trace gas measurements that could provide information on the air masses and potential mechanism of the new particle formation in EIL?

(2) Figures 5-6: Given enhanced new particle formation in the EIL is one of the major conclusions, I would suggest plot CN(3-10 nm) as function of altitude in EIL (similar to Figures 5 and 6). This may provide more insight into the mechanism of new particle formation.

(3) Line 168-169: Based on Figure 3, the highest number concentration for particles with Dp between 10 and 110 nm was in FT1 and FT2 layers, instead of FT2 and FT3.

(4) Line 214-216, The concentration of CN(3-10 nm) is substantially lower than CN(10-110nm) in both EIL and FT. I think the new particle formation is likely slow, and the growth of newly formed particles to CCN and optical active sizes is also very slow. I am quite convinced that these nucleated particles have significant impact on marine CCN budget. Could the author comment on the rates of new particle formation and growth?

(5) Line 229: Should "..EIL presumably insight..." be "...FIL provide insight..." instead?

(6) Figure 9 and related discussion. Could the influence of STBL on EIL aerosol properties be related to the strength of the inversion? I would suggest include the vertical profile of potential temperature to these plots.

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