Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
https://doi.org/10.5194/acp-2022-108-RC2, 2022

Comment on acp-2022-108

Anonymous Referee #2

Referee comment on "Life cycle of stratocumulus clouds over 1 year at the coast of the Atacama Desert" by Jan H. Schween et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-108-RC2, 2022

Review of the article titled "Life Cycle of Stratocumulus Clouds over one Year at the Coast of the Atacama Desert" by Schween and coauthors for publication in the Atmos. Chem. Phys.

The authors have used 1-year of data collected at the airport site in Northern Chile to document the seasonal, and diurnal cycle of clouds, water vapor, LWP and turbulence. Focus is on marine boundary layer clouds. The article is overall well-written and will be of interest to the general meteorological community. Data in that part of the world is very rare, so the work is novel. Please find below my comments that can further improve the paper.

Major Comments:

The paper is very long at this moment with 16 figures and 2 tables. I suggest you combine some of the figures and maybe put some in the supplemental material to reduce the paper. Figure 5 is redundant due to figure 6, so maybe put figure 5 in the supplemental material. Same thing can be done for Figures 12 and 13. You can also combine the Figure 6 and figure 7, by putting the cloud boundaries on top of the cloud fraction. Currently the paper is too long, and it will be good if you can bring it down to ~10 figures. Thanks.

Figure 14, 15 and 16 and the associated text, you have tried to probe largescale fields that might control the boundary layer dynamics and cloudiness. I suggest you plot the lower tropospheric stability (Klein and Hartmann, 1993) or Estimated Inversion Strength (Wood and Bretherton 2006). You can further plot all the reanalysis reported surface sensible heat flux and latent heat flux. These quantities over the ocean and over the land site will tell you if there are any local factors that differ from the ocean and the site. This might also illuminate why the marine clouds evaporate over land at your site. Your explanation of stability and winds etc. ignores advection, and it can simply be the case

that the clouds form over the ocean and dissipate over land due to lack of moisture supply from the surface, rather then shortwave heating.

Figure 15 is not in a suitable form. The standard deviation lines are not visible for any season except JJA.

I think it will be good if you plot the phase diagrams of surface winds to understand any local circulations. There are many papers on such a phenomenon, so not going to mention here. Please look at papers that probe the land-sea breezes. Probing this will make your article much stronger. Thanks.

Last major thing I will mention is the lack of information on profiles of turbulence. The Doppler Lidar was pointing vertically, so you can derive estimates of variance and skewness of vertical velocity. These are also used for PBL classification. I suggest you show the diurnal cycle of these quantities same as you have done for cloud properties.

Minor Comments:

It will be good if you show the diurnal cycle plots as a function of local time rather than UTC. This will make things easier to understand.

Line 23-24: Mention precipitation loss of water too. Also, not sure what you mean by "fresh". Thanks.

Line 39-41: These are very bold statements. So can you please add reference to support them? Thanks.

Figure 1: Not sure what is the point of showing cloud boundaries on this map. They are also difficult to identify and not discussed in the text.

Line 111: you mean "eastern Pacific"?

Line 220: "situation" seems like a strange word to use here.

Line 231: do you mean “evaporate” the clouds? Dissolve has a solid into liquid connotation.

Line 248-253: Seems that the text contradicts the figure. Can you please double check? The numbers don’t seem to add up.