GENERAL COMMENTS

Fog is an important source of moisture in arid regions, and thus, the question of when and where fog is present is of high importance. This well-written paper investigates how biomass-burning aerosols (BBA) influence the (diurnal) dissipation time of fog/low cloud (FLC) events in Namib. Various satellite data and reanalysis data serve to analyze differences between high and low biomass burning conditions revealing significant differences also in respect to the meteorological conditions. Finally, a statistical model is built to predict the dissipation time from meteorological fields, showing the difficulty of disentangling aerosol and meteorological effects. The paper is certainly interesting for ACP and of high quality, however, I have several comments/ideas for further improvement.

- The area of investigation is rather void of observations. Therefore, reanalysis highly depends on satellite data, which have problems in resolving the boundary layer, and the underlying NWP model. Because the 4D-Var data assimilation uses 12-hour windows (from 09 UTC to 21 UTC), jumps can occur at these times in parameters (such as water vapor) that are not constrained strongly by observations. This might influence the results in Fig. 6 as the largest changes exactly occur around the 9 UTC time. As an example, you can find the diurnal cycle of total column water vapor for Iquique, Chile, at the coast of the Atacama. Here the 21 UTC jump is most pronounced. I find the physical explanation for the behavior sound, but it would be good to check the consistency of your data and mention ERA5 limitations in the manuscript.
- I like the classification into low and high BBA conditions, which have, by definition of the percentiles, the same number of members. However, I am wondering whether one could be even more successful with an event-based approach, as I suspect that the BBA effect is most effective during selected episodes when filaments of moist and polluted air arrive in the target regions. Especially for the southern CN region satellite total column water vapor images sometimes hint at this. Therefore, it would be good to see the frequency distribution of CAMS BCAOD to illustrate how the 25 and 75 percentiles are derived and also how they differ for both regions.
- Coming back to my suspicion that the strong pollution mainly occurs as episodes. This counteracts the assumption of a linear model to predict FLC times. Why didn't the authors perform trajectory calculations (such as in Andersen et al. (2020) to check the meteorological similarity of the different BBA events?
- The target of the study is the dissipation time. Therefore, it would be good to provide more information on its variability, not only the aggregated statistics (boxplot) from Fig.3, especially as this variability is not well reproduced by the regression model (Fig.7). For these figures and all further analysis two geographical regions (AN, CN) are considered over which averages are provided. Even after looking at the study by Anderson and Cermak (2018) the motivation to put everything together in the two regions was not clear for me. Why not look at continuous development as a function of latitude and similarly as a function of distance from the coast (which the authors themselves mention to have a strong influence)? Maybe this information could be shown graphically to motivate the choice of the two regions. In this respect, it is also not clear to me how clear sky days are treated, e.g. coastal clearings.
- The last paragraph of the introduction contains the hypothesis states that BBA events modify the inversion and the early morning development of the planetary boundary layer. Partly, this is nicely shown in Fig. 6) but what about other parameters, such as boundary layer height or water vapor (as Q975 is so important in the ridge regression)? Vicencio et al. (2023, Fig. 10) showed that the Namib has an especially high variability in boundary layer height in austral summer. Therefore Q975 might sometimes be in the BL and sometimes not.

SPECIFIC COMMENTS

- Abstract. Mention that you are looking at the time of day when the fog is dissolving. The reader could also think that dissipation time is the duration of a fog event.
- Introdcuction: please briefly explain the diurnal coastal circulation
- L25 better represent instead of resolve
- L74 define semi-direct
- L74-79: Here, it would be good to mention briefly how you want "to disentangle the BBA effects from other meteorological covariates."
- L97: Does 97% mean the hit rate excluding false positives? Or the CSI?
- Section 2: I had difficulties to extract information on data amount and resolution.
  <u>Amount of data</u>: June to October is roughly 150 days; with 15 years, this makes 2250 days. However, you have about 200 samples in one quartile, making the total sample about 800 days. What about the rest?
  <u>Resolution of SEVIRI:</u> My assumption is that each area has a grid (about 6 pixels in longitudinal and many in latitudinal direction). For each gridpoint, you have (at most) one dissipation time per day. Is this correct? If yes, then it may help to delete the 15-minute resolution in line 109. It would also help to say in Fig. 3 how many data points are going into each bar. have: are available
- Fig.2 Why don't you show this separately for the high and low BBA situations? This would strongly help to better understand the differences between the ABN and CN region.
- L117: Please motivate why early morning. – this only comes later in L128. At this time the reader does not know that early morning is the most frequent dissipation time
- L139: Please explicitly say in contrast to all other data another time range is used due to…-
- L170: Is the area large enough to encompass the important transport aspects? To make it easier for the reader, It would be good to mark the two regions in Fig. 4
- L163: What is actually the resolution of your predictand. Is it the average FLC in one region per day or do you do it for each satellite pixel? I assume the average as you compare it in Fig.7 with the observed medium dissipation time? Still, this could have effects on the variability of FLC, which is poorly predicted.
- L164: It might be lengthy, but it is good to have the list of variables of the "spatial fields of ERA5 meteorology" used as predictors. Is subsidence included?
- L198: Mention the definition of variability, IQR?
- L206: Motivate 650hPa. It is done later but before wrote that the transport is highest in 650 hPa (L183). Z and Q are not defined,
- L247: grid cell is better than pixel here
- L231: T2M not defined
- L275: A correlation coefficient of 0.58 (explained variance 0.34) is not too bad. Did you try to identify the cases when especially poor predictions were made, e.g. by colouring scatter diagrams etc?
- L323:"These contributions are due to a negative SST anomaly close to the coastline which may be explained by the greenhouse warming in the free troposphere". Not clear to me..

- Conclusions: Wouldn’t radiative sensitivity studies also be helpful in disentangling water vapor and BBA contributions?

TECHNICAL CORRECTIONS
- L 160: Greek letter for lambda
- I find that the readability of the text is degrading when figure caption information (that is not important for following the text) is repeated in the test. My recommendation would be to remove -statements such as in L210 (Additionally, in the Q975 fields (Fig. 5c and d) the subsurface regions at this pressure level are masked). Or statements such as like “are shown in the third panel.”, “dashed lines”.
- L330. Blank missing

Reference

Vicencio, J., C. Böhm, J.H. Schween, U. Löhnert, and S. Crewell, 2023: A comparative study of the atmospheric water vapor in the Atacama and Namib Desert, Global and Planetary Change, 104320, https://doi.org/10.1016/j.gloplacha.2023.104320.