Review of “Marine Stratocumulus to Land Fog Transition in the Coastal Mountain-Range of Atacama Desert” in Atmospheric Chemistry and Physics (ACP) by Lobos-Roco et al.

General

The submission “Marine Stratocumulus to Land Fog Transition in the Coastal Mountain-Range of Atacama Desert” is in my opionion a suitable entry for the journal Atmospheric Chemistry and Physics (ACP). The research article describes in detail the setup, instrumentation and measurements during the StraToFog campaign in the Atacama desert in Chile. During the field campaign of around 11 days, fog as a result of inland advection of the 200 to 400 m thick Sc layer was recorded along an transect going from the slightly offshore to 15km inland at 7 locations. This allowed the disentangling of the the MBL evolution, the various micrometeorological processes and their dynamics throughout the fog events. Initially a case study is used to discuss in detail the fogs influence before generalisation for the whole measurement period, giving an interesting insight into the fog characteristics.

I do recommend publication but advise to 1) streamline some issues outlined in the below major and minor comments, especially as these would enhance the quality and understandability of the article.

Major Comment(s)

C1: Several of the figure captions are confusing as they list the wrong station/distance/height, e.g. Fig7 states “site C approximately at 860 m ASL (5 km offshore)”, according to Table 1, site C is at 55 m ASL and 2km inland. Please check them carefully and I suggest also to say inland distance as offshore generally implies on the ocean rather than inland. The same holds true for the schematic figures. It would be useful to mark in all schematic figures the station location. Based on Fig 1a/b I find the vertical profile somewhat misleading as Fig1b gives the impression of gradual increase while Fig 1a shows that the slope from the ocean to D is simply less steep – not that there is another step in the terrain. Furthermore, there is some general inconsistency for the format of the stations, namely sometimes in brackets, sometimes without. In the same line I would strongly suggest to split E into two letter due to their altitduinal difference, meaning E_leeward becomes F and F becomes G.

C2: I find Table 1 with the instrumentation difficult to read as there are 2 EC systems at E but from my understanding only one precision scale? Based on Fig 1, it seems that this balance is overly exposed to the air (if it is the device in the middle of the image) and thus vibration as well as enhancing cooling. Were steps taken to enhance the representation of this scale accordingly as the exposure especially would lead to jitter in the measurements and higher cooling to added dew as a preferential surface for condensaton.

C3: The fog collection rate is in my opinion strongly dependent on wind speed as higher wind speed transport in the same time interval a higher number of droplets through the sampling interface of the SFC. As such, comparison of different event would be better with a normalisation and also allow for better yield calculation.

Minor Comment(s)

L11: Why does lower air temperature lead to lower liquid water content? Couldn't additional water vapour condense out?

L27: Do you mean "due to the growing" .. "ever more attention"/"attention is increasingly being given" ... "in recent years"?

L17-41: I'm missing some information on the Sc deck regarding typical cloud thickness/CB/(CT is given at ~1000) as these values are relevant for the transition to fog/intersection with the mountain range. (thickness is in L46 but would be helpful before).

L80-L90: I think it is better to keep everythin in m ASL as this relates best to the Sc and its relative location. AGL is primarily relevant for the UAV limitations and should be given there in brackets (where not ~1200 m ASL is given).

Fig 2: I suggest to add 1-3 satellite images of GOES-E here for the selected event discussed in Fig 3.

Fig3: It might be interesting to use the ascent speed of the radiosonde as an indicator of vertical wind and thus maybe entrainment? It would be useful to start with d instead of a here, and mark the Sc layer (evident by q) in the remaining three figures with a contour.

L177: Does not the dynamics itself not also influence this, and lead to the strong increase of CT as air flow drives the fog up the mountain, especially in the afternoon as shown also by Fig4?

Fig 6: This figure should be extended to give time series at all stations for this particular event, thus facilitating the understanding of the dynamics of the time period and allow a direct comparison with Fig 7.

Fig 7: Suggest do add the difference e_s – e on the left axis in Fig 7c.

L257: by T_s → by T_s in this and similar environment

L291-293: This is rather an effect of the advection as described in the lines just before, not that fog forms or do you mean when no advecton occurs here? If so, this is not clear. These lines should be part of the previous paragraph, i.e. each state of the three should be a seperate paragraph to faciliate the reading. I would actually suggest to start with the morning setting in both the text and the schematic in Fig 10.

L308: But its already advected fog (or the advected Sc layer) beforehand? The change is mainly that air is still saturated now also on the leeward side?

L317: There are more sources for the Namib and similar processes, namely many by Andersen et al. and a similar field campaign is outlined in Spirig et al.

L326-L333: Give some context how far away the sampling occurred to give easy context for comparability

L336: I'm missing the reference of Feigenwinter et al. since they used microlysimeters in the Namib desert too.

L376-379: Is this also relevant for AW predition for the use of fog water as additional water source?

Typos/Editorial suggestions

L4: "this relevant system" → "this crucial process" (since it's about advection/transition)

L5: at the coastal → in the coastal (or at the coast of the Atacama)

L8: Ensure “15” and “km” are on the same line with a non-breakable space or \: if written in latex

L11: “due to lower wind speed and liquid water content” → “due to both lower wind speed and lower liquid water content”.

L17: results in fog at the→ “results in fog due to the intersection of the Sc with the”

L19: on Earth: the Atacama Desert → “on Earth that is the the Atacama Desert” or “on Earth, the Atacama Desert”

L27: to ecological → to the ecological

L48: fog can be intercepted by rocks → water from the fog collects on

L58: this research aims to → we aim to/our research aims

L59: StraToFog, designed through a topographic → with StraToFog with a topographics transect experimental design/setup to …

L67: relic fog oasis?

L 68 crust(Lehnert → crust (Lehnert

L70: elevates → rises

L71: landscape → the landscape / on the surface, due to → on the surface due to

L72: the experiment was deployed → measurement were conducted

L74: from a ~2km → from ~2km

L77: to the vertical → by the vertical variability?

Fig1: Source for a? Google Earth? Self-made? (looks nice)

L96: which included → which influenced

L98: to weigh → weighing (or simply measuring the weight of a …)

Tab1: localization → location

Fig2: I suggest to show c/d closer on the region as the pressure systems are large enough to be clearly seen even when zoomed in a bit more. Also “The saded time period correpsond” → “The shaded time period corresponds”

L121: StraToFog is italic in other places, but normal here. Change here to be consistent

L134: around 15 K. → around 15 K over 300 m height difference – so 5 K/100m?

Fig3: It would be helpful to add a vertical line at 16 LT in the vertical time profiles so that its evident without the caption when the ascent happened

L155: in (Schween ..) → (Schween …)

L166 between 2 and 3 km → between 2 and 3 km inland

L167: The CT between 2 and 3 km inland → The CT remains nearly constant over the same distance, …

L173: This lifting of the CB → This lifting of the CB and CT?

Fig7: correspond to → corresponds to

L221: conductive → conducive

L223: e and es near → make italic or use math symbol as introduced on the line just before.

L244-L245: indicating that the weight measured by the high precision balance is decreasing, which means surface evaporation → as evaporation occurs, reducing the weight measured by the high precision balance.

L257: predicted by T_s → predicted by T_s in this ecosystem

Fig8e: Add vapor adsorption with marker similar to dew/fog

L247/Fig8: In L247 it's vapor absorption and in the Fig8 is vapor adsorption, I would think its mainly adsorption as surface process/top most mm of pore volume maybe? If intentional disregard

L264: respectively (Fig. 1b) → respectively (Fig. 1b) during the time from the 25th of July onward, i.e. the time period with nightly fog events.

L267: low radiation → low net radiation? Clarify if net or you refer to a component

L269: where Sc cloud → where the Sc cloud

L289: weakens as it is → weakens over the course of the night?

L291-292: oversatured air is induced by atmospheric cooling; then e_s decreases to reach e → air oversaturates due to atmospheric cooling as e_s decreases down until e.

L293: yield low → yields low

L293: remains trapped → remains capped by the subsidence

L293: although unsaturated (RH < 100%) → although humidity decreases below 100% due to the descent of air on the leeward side.

L298: as a consequence of fog dissipation, air temperature → as a consequence of fog dissipation, the surface is receiving solar irradiation, in turn increasing available energy and thus initiating stronger turbulent fluxes as well as an increase air temperature.

L302: the topographic barrie → the topographic barrier and continous advection of the Sc layer, ..

L304: ocean mostoire advection → ocean mostoire advection under the Sc layer

L305: (Fig. 7b) (Montecinos et al., 2018) → (Fig. 7b and Montecinos et al., 2018)

L307: while the → despite the ... due to the strong RH gradient ...

L320: CT → Cts

L360: flux and dew formation → flux and also dew formation due to ongoing radiative cooling

L360: sunrise onwards, surface temperature triggers → sunrise onwards, surface temperature increases as the Sc/fog only partially blocks solar irradiance, which triggers the turbulent fluxes.

L378: StraToFog → *StraToFog*

Supplementary