

Review of “Synoptic and regional-scale meteorological controls of stratus altitude in the Namib Desert”

by Hipler et al.

General comments:

In their study, the authors explore the effect of regional- and synoptical-scale impacts on fog and low clouds in the Namib Desert. They show that while fog conditions are related to high pressure over continental southern Africa in combination with the regional-scale impact of thermotopographic circulation, low cloud situations are associated with a deeper marine boundary layer due to stronger heat fluxes over the Atlantic oceans, which stems from a stronger Atlantic High.

The manuscript is logically structured, well-written, and fits into the scope of ACP. I have some remarks regarding the physical mechanism behind the mountain-plain wind and some recommendations on how one could better tease out the regional-scale and synoptical-scale signals. The manuscript merits publication once my concerns are addressed.

Specific comments:

- As you stated in the manuscript, both synoptical- and regional-scale effects can influence the occurrence of low clouds/fog. To be able to better distinguish between the two, one could analyze the geostrophic (synoptic, calculated from geopotential) and ageostrophic (regional, difference to modeled wind) wind components and relate them to the occurrence of low clouds/fog. One could then use them for the wind arrows in the vertical cross sections (e.g., Fig 4 a-f, Fig. 7).
- Besides the regional signal in the pressure gradient P_{diff} , there could also be synoptical-scale pressure gradients between the ocean and the continent, which are superimposed on the P_{diff} . Why not subtract the large-scale pressure gradient to isolate the pressure gradient caused by thermotopographic circulation?
- L11, P235: The authors discuss that elevated continental pressure in fog situations prevents convective mixing in the Namib regions, which helps to establish a temperature gradient between the Great Escarpment and the plains. Firstly, I wonder whether it is the reduced mixing over the Namib or rather in the mountainous areas of the Great Escarpment and the high plains east of it where the cooling is actually taking place. Secondly, you are looking at the early morning, so convective mixing will only play a minor role during that time of day. I would rather argue that during the fog season, residual convective cloud cover over the Great Escarpment is minimal, as little convective clouds form during the day. This consequently leads to stronger radiative cooling during the night compared to the more convective austral summer, causing stronger katabatic/mountain-plain winds.

Minor Remarks:

- Fig. 4 g-l: Here, you use temperature and specific humidity at 950 hPa. Looking at the topography of southern Africa, surface pressure will be lower than 950 hPa in many regions due to the high surface elevation. This means that data at this pressure level is extrapolated to the 950 hPa level. I recommend masking out those regions and/or choosing a higher pressure level.
- P5, L122: Missing reference.