Deroubaix et al., 2018, ACPD, Diurnal cycle of coastal anthropogenic pollutant transport over southern West Africa during the DACCIWA campaign

General Description:

The authors use surface and aircraft observations, radiosondes, satellite observations, and a model to determine the diurnal cycles of NO_x and CO at a short-term monitoring site in southern West Africa and assess the contribution of individual sources and synoptic-scale meteorology to this diurnal variability. The figures are clearly presented and the model tracer simulation experiment is informative of the varying contribution of pollution from cities and other sources to pollution at the monitoring site. The content is appropriate for ACP, but there is limited context for the relevance of the results for other time periods and locations in southern West Africa and the implications of findings for future air quality due to increasing urbanisation and changes in biomass burning (Andela et al., 2014). It is for this reason that I'm hesitant to accept as is and highly recommend that the authors strengthen the relevance of the paper by addressing its limited scope.

General Comments:

How does the paper fit within the context of other findings from analysing observations and model output during DACCIWA, and also enhance understanding of the region since the AMMA campaign?

There are many typos that can be eliminated with a careful reread (extents on P2, L5; 21th on P2, L9; acquiered on P4, L18 etc.).

Please fix incorrect order of in-text citations when there is more than one article in the same year by the same first author (P2, L14; P2, L27 etc.).

Why does the study focus on Savè, beyond logistics? Is there rapid population increase? Is it an ideal location to understand synoptic scale meteorological patterns in southern West Africa? This could be better justified.

Only 7 days of observations are considered. Can we draw conclusions about an extended time period based on this brief analysis period? And if so, what time period? The full year? The entire monsoon period? The onset period only?

Absent from the study are measurements and/or a discussion of non-methane volatile organic compounds (NMVOCs) and aerosol mass concentrations and composition. Emissions of these are high from local sources and from distant biomass burning (Liousse et al., 2014; Marais et al., 2016; Janicot et al., 2008; Reeves et al., 2010). Can the same conclusions about sources and diurnal variability be drawn about these? Were these measurements made during DACCIWA on the aircrafts flown? If so, do these offer any utility in understanding these pollutants or confirming similar diurnal behavior? If not, are there other studies that could be referenced to assess the sources of these pollutants and the implications for air quality?

Change MODIS-AOD to MODIS AOD throughout.

The figures are presented out of sequence in the text (e.g. Figures 11 and 12 are mentioned before Figure 3). Please reorder the figures so that these are introduced sequentially.

Include a link to the MODIS AOD product used in this work (preferably doi, otherwise URL).

Shorten the conclusion to the main findings of the paper, rather than providing a detailed overview of the methods, results, and outcomes.

Specific Comments:

P3, L12: Consider instead referencing a relevant publication from AMMA or from analysis of MOZAIC vertical profiles that finds influence of Central African biomass burning on atmospheric composition in southern West Africa.

Table 1: The table title says 2015 population but from a 2011 Revision. Are these projected estimates? Why not use a recent revision? No reference is provided for the 2011 Revision, so it's not possible to assess what the 2015 population is when it was revised in 2011.

Section 2.2: Are the dashed indented lines headers? These are unnecessary. Instead integrate these in the relevant paragraph and make clear in the first sentence what the paragraph is about.

P5, L9: How frequently are the radiosondes launched during the time period considered in this study?

P5, L12-17: How are biomass burning layers identified with a total column AOD measurement?

P5, L20: How accurate is CALIOP at distinguishing aerosol types?

P5, L28-29: Knippertz et al. (2017) isn't the seminal paper on defining the monsoon onset period. Do the authors mean to say that the monsoon onset period specific to DACCIWA (2016) is 22 June to 20 July?

P6, L23-30: Elaborate on the pseudo-anthropogenic emissions that are imposed. Are these based on an existing inventory? How much is emitted per one million inhabitants? Does the imposed magnitude of emissions matter?

P7, L9-11: Was there any rain during 1-7 July that would cause aerosols to wet deposit and so affect interpretation of output from a model that does not include sinks?

P7, L26-28: This transport pattern has already been observed during AMMA and before that using MOZAIC aircraft campaign observations. Consider including these studies too to reinforce that this work builds on previous research and campaigns.

Figure 3: How representative is the site of the coincident 2 km x 2 km model gridsquare?

Section 3.2: "From research aircraft" and "From radiosondes" are not complete headers. Consider revising.

P11, L1: Why define this "feature G". It's not used again and doesn't seem to appear in any of the figures.

P12, L30-35: Does interference in the NO_2 measurement from dissociation of NO_x reservoir compounds (Reed et al., 2016) impact the interpretation of NO_2 and NO_2/NO diurnal variability?

P13, L27-29: This result isn't surprising, as the monsoon flow is prevailing southwesterly and so transport from Lagos isn't expected. It would be more noteworthy if this did occur.

P14, L1: What is the implication on future air quality that the Cotonou plume affects Savè?

Videos: Consider adding annotations or narration to the videos to guide the viewer. Also consider adding time stamps in the text to point the reader to these specific features in the videos.

<u>References:</u>
Andela et al., doi:10.1038/nclimate2313, 2014.
Janicot et al., doi:10.5194/angeo-26-2569-2008, 2008.
Knippertz et al., doi:10.5194/acp-17-10893-2017, 2017.
Liousse et al., doi:10.1088/1748-9326/9/3/035003, 2014.
Marais et al., doi:10.1021/acs.est.6b02602, 2016.
Reed et al., doi:10.5194/acp-16-4707-2016, 2016.
Reeves et al., doi:10.5194/acp-10-7575-2010, 2010.