EGUsphere, referee comment RC1
https://doi.org/10.5194/egusphere-2022-383-RC1, 2022

Comment on egusphere-2022-383

Anonymous Referee #1

Referee comment on "Biomass Burning and Gas Flares create the extreme West African Aerosol Plume Which Perturbs the Hadley Circulation and thereby Changes Europe's Winter Climate" by Keith Alan Potts, EGUsphere, https://doi.org/10.5194/egusphere-2022-383-RC1, 2022

Review of manuscript "Biomass Burning and Gas Flares create the extreme West African Aerosol Plume which perturbs the Hadley Circulation and thereby changes Europe's winter climate"

This manuscript explores a hypothesis identified in the study that anthropogenic influence from increased biomass burning and gas flaring in West Africa has perturbed winter European climate via circulation changes associated with the frequency of continental high pressure blocking of North Atlantic weather systems.

The analysis identifies a specific seasonal aerosol plume that emerges each year in West Africa from December through to April, and introduces a terminology "the West African aerosol plume", within a proposed categorisation of 8 "continental-scale aerosol plumes" in existence in the present-day atmosphere.

The manuscript'a Abstract acknowledges the analysis is to-some-extent preliminary identifying the presnted information as "a first step" in relation to a specific tele-connection between the central Africa pollution and winter climate in Europe.

However, whilst the topic is interesting, and has the potential to progress to a pubishable analysis, several parts of the current manuscript are poorly worded and present too certain a narrative in relation to the magnitude and causality within the results presented: a set of individual trend analysis of different observational datasets.

Also, the climate influences from anthropogenic aerosol are well-known, whilst

the manuscript seems to present the analysis as establishing something new.

In its current state, the particular advance presented in this manuscript is not sufficiently explained. Whilst there is a moderate referencing of other related studies such as the Fawole et al. (2016b) analysis to establish signatures of gas-flaring within AERONET aerosol optical properties, the manuscript in its current form does not yet inform the reader of the specifics of the findings in relation to the relatively recent progression in understanding from being able to isolate the role that gas flaring black carbon and sulphate aerosol plays alongside desert dust and other aerosol types/sources within the West African aerosol plume.

Overall, the manuscript reads like a report that has not yet been worked-up sufficiently to be at a publishable-level analysis, and requires further work to set out and establish a particular advance it represents within the current scientific literature on at least one of the two topics it addresses: the West African aerosol plume (and/or associated radiative effects), and/or its influence on European climate.

A general area of improvement also is in the scientific writing style, where the precision and specific language used needs to reflect the multiple influences that combine both from the aerosol plume and its climate affects. Too often the current wording sometimes seems to indicate a unique causality of effect, via "creating" a system or effect.

The title for example refers to the West African Aerosol Plume, and whilst the definition presented in the manuscript is clear this terminology refers to a particular season, the reader cannot be expected to appreciate that within the title itself.

The climate influences the manuscript points to are currently presented only in the frame of correlations, and whilst that does not necessarily preclude the manuscript from being publishable, the narrative of the manuscript presents the correlations as indicative of a causal relationship.

Although previous studies have indeed identified a strong signature of gas flaring aerosol (Fawole et al., 2016), this study explores only trends in total aerosol optical depth, then dependent on that previous finding, rather than this being a result established by this manuscript. So the title should not present that as the topic of this paper.

A revised title should reflect at least some of the broader context for the research, and set out the main finding it addresses (rather than a simple causality and specifics of the datasets it analyses or methods it applies).

When re-drafting the manuscript the author needs to ensure the narrative conveys the broader influences on the North Atlantic and European climate, with currently almost no recognition of the primary role of greenhouse gas changes and more general anthropogenic aerosol influences (see e.g. Booth et al., 2012).

A potential future re-working of this manuscript could address trends in multi-wavelength aerosol optical properties, aligned to the AERONET analysis from Fawole et al. (2016), but the current analysis seems to assume 100% of the AOD comes from these sources.

I would advise the author also to present the analysis within established metrics for the effect he identifies is perturbed by this regional aerosol system, primarily the index for the mode of climate variability known as the North Atlantic Oscillation (e.g. Stephenson et al., 2006).

The Introduction needs also to be refer to some of the extensive literature exploring changes in blocking frequency and European winter climate (e.g. Shabbar et al., 2001; Buehler et al., 2011; Breton et al., 2022). The manuscript would be strengthened also by explaining the role of gas flaring pollution, see for example he review paper by Fawole et al. (2016a), and references therein.

I realise the author will be disappointed in this rejection and re-submission finding, but the manuscript has promise in identifying the specifc tele-connections between the under-appreciated gas flaring sources and European climate.

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