The major concerns raised by the 2 reviewers were not addressed adequately. I would like the authors to focus on these two comments without avoiding them:

The comment of reviewer #1 concerning the following caveat: "This differentiation between dust-laden and dust-free analysis is important to bring out the effects of dust on a dynamical system that is strongly coupled to its variability". I expect a more complete answer than simply mentioning that this will be studied in a future paper.

We appreciate the editor suggesting that further effort is required to respond to the comment of reviewer #1 about diagnosing the response to the dust in a dynamical system where the dust is strongly coupled to the variability of the dynamics. First, we have performed the additional analysis suggested by the reviewer to evaluate our results for different wind speed conditions of the African Easterly Jet. This was accomplished by reproducing the result shown in Figure 4a of the paper separately for samples from 3 separate terciles of the AEJ mean wind speed; i.e. the samples associated with the lower, middle, and upper third of mean AEJ wind speed. There are some subtle differences in the resulting relationships between the AEW EKE and the dust radiative forcing, but the main result, that the EKE is enhanced along the southern track of AEWs to the south of the core of the AEJ and in the outflow region to the west of the northern track of AEWs, is robust to variations in the AEJ speed. This at least builds some confidence that the result we are seeing is not just a consequence of a simple correlation of both components to variations in the AEJ dynamics.

We added this result to the supplementary figures (now Figure S5). Discussion of these results, including the point made above, is now included in the manuscript on Page 24 paragraph beginning Line 5 through Line 16 in the version of the revised manuscript with tracked changes.

Furthermore, we have expanded the discussion in Section 2.1 (Page 8 paragraph beginning Line 10 in the version of the revised manuscript with tracked changes and Section 4 (Conclusion; Page 29 paragraph beginning Line 16 to the end of the paragraph on Page 30 Line 22, to expand upon this point and where this paper, given the methodological choices made, fits within the broader study of the role of dust effects on AEW dynamics. We have tried to be more explicit and direct about the limitations of using reanalysis data and the fact that the dust and the waves are fully coupled to the circulation in this dataset. Nevertheless, we argue that the use of a model more tightly constrained to observations, and hence exhibiting a more realistic representation of the circulation, is an advantage of this study. We acknowledge that there exists a prior body of both empirical and modeling work that has advanced the hypothesis that dust radiative effects may be playing a role in enhancing AEW activity and that our empirical approach seeks to determine if the empirical relationships in reanalysis data are consistent with that hypothesis. We argue that both the addition of the analysis suggested by the reviewer (discussed above), as well as the temporal lag analysis that was included in the original submission, are included precisely to help us build confidence that the empirical relationships are consistent with the hypothesis and not just a consequence of a correlation of both dust and AEWs with the overall speed of the AEJ circulation.

Furthermore, we seek to advance a methodology for exploring the energetics of AEWs and their relation to dust radiative effects that is suitable for probing in greater detail how dust may affect the energetics of AEWs and is a methodology that can be applied equally to reanalysis output, as well as the output from controlled model experiments where dust radiative effects can be turned on and off. We believe that the work presented in this manuscript is a reasonable addition to the growing body of research on this topic. Also, it advances a novel approach to studying this problem, and helps to evaluate an open hypothesis in the literature for the effect of dust radiative processes on AEW dynamics.

As reviewer #2 points out, a discussion of the results described is absent from the manuscript: "There is no discussion about their results (especially section 3 and conclusions) with updated research (For example, the above references). The manuscript needs to be improved and justified through discussions of novel peer-reviewed publications." The few sentences that were added to the conclusion do not constitute a discussion and there should be more effort put into showing how the results from this work complement what other authors have published before.

We appreciate the editor suggesting that further effort is required to respond to the comment of reviewer #2 about the discussion of the results with updated research.

1. We added a new table (Table 4) to the Conclusion Section to summarize the important studies with similar topics (Page 42 in the version of the revised manuscript with tracked changes):

Table 4. Summary of relevant publications focused on the impact of dust on AEJ/AEWs.

Study type	Publication	Highlights
Data analysis	Jones et al. (2003; 2004)	Using 22-year reanalysis data and the outputs of a dust model, they showed that dust is associated with the enhancement of AEWs.
	Hosseinpour and Wilcox (2014)	Using 13-year reanalysis and satellite data, they showed that dust radiative forcing is correlated with meteorological features of AEWs.
Modeling	Ma et al. (2012)	By conducting regional numerical simulations of WRF for dust outbreaks and modifying heating rates within the model as a way to account for dust, they showed that dust heating has a weak positive impact on AEWs via promoting convection.
	Grogan et al., (2016; 2019)	Using an idealized version of WRF coupled with a dust model and with a supercritical background flow, they found that dust enhances AEWs through a buoyancy source.
	Bercos-Hickey et al. (2017; 2020)	They performed numerical simulations using WRF radiatively coupled with a dust model, and showed that both AEJ/AEWs shift northward and westward by dust.

2. We added more information to the first paragraph of the Conclusion Section, Page 27 beginning Line 19 to Page 28 Line 8 in the version of the revised manuscript with tracked changes:

> “While previous studies showed the impact of AEJ Saharan dust transport across the Atlantic Ocean (Perry et al., 1997; Liu et al., 2008; Francis et al., 2020; Francis et al., 2021) the feedback of dust to AEJ-AEW is not well understood. A few recent studies showed that dust affects the atmospheric dynamics of the Atlantic Ocean by enhancing AEW strength (e.g., Jones et al., 2003; 2004; Ma et al., 2012; Hosseinpour and Wilcox,

2014; Grogan et al., 2016; 2019; Bercos-Hickey et al., 2017; 2020) (Table 4 is provided for more details). However, the mechanisms of such effects are still unclear. Moreover, to the best of our knowledge, the mechanistic effects of dust on the eddy energetics of the waves have not been addressed in previous studies. This has motivated us to explore relationships between dust outbreaks and metrics that quantify the production of eddy kinetic energy in AEWs toward a deeper understanding of the role that the dust radiative effect may play in the production of eddy kinetic energy of AEWs."

3. We also added the following part in the last paragraph of the Conclusion Section (Page 30 Lines 16 to 22 in the version of the revised manuscript with tracked changes:

> "Although a few studies (e.g., Bercos-Hickey et al., 2017; 2020) used regional models, to the best of our knowledge, there is no global climate model study that explicitly quantifies the impact of dust on AEWs in a coupled system. The empirical relationships apparent from this study will be examined in a follow-on study of atmospheric general circulation model simulations using the Community Earth System Model (CESM) with and without the dust radiative effect to further explore the hypothesis linking dust radiative effects to AEW dynamics."

The following parts of the manuscript also address the reviewer's comment. These were already included in the previous version of the manuscript:

4. Objectives of our study, compared to previous studies- Last paragraph of the Introduction Section; Page 6 Lines 9- 21 in the version of the revised manuscript with tracked changes:

> "While previous studies showed the impacts of dust aerosols on climate (Ming and Ramaswamy, 2011; Hosseinpour and Wilcox, 2014; Chen et al., 2021; Liang et al., 2021; Grogan et al., 2022), hydrological cycle (Konare et al., 2005; Kim et al., 2010; Bercos-Hickey et al., 2020) and cloud properties (Weinzierl et al., 2017; Haarig et al., 2019), these elements of the climate system in this region exhibit strong variability due to AEWs. To understand the details of interactions between dust aerosols and climate over the Atlantic Ocean, it is essential to understand how the evolution of AEWs is determined by both diabatic heating, as well as exchanges of eddy kinetic energy (EKE) within the jet-wave system and how dust may contribute to the energy driving AEWs. Toward this goal, we apply eddy energetic concepts to further analyze the relationships between dust and the AEJ-AEWs system to gain insight into the impacts of the dust aerosol radiative effects on the development of AEWs and the distribution of kinetic energy from the source of instability (i.e., AEJ)."

5. Advantage of our method, compared to the methodology of the previous studies- Section 3, the first paragraph of Summary of the results; Page 15 Line 6-19 in the version of the revised manuscript with tracked changes:

> "Traditional studies have used the mid-tropospheric trough and ridge from unfiltered wind fields to diagnose the AEWs. In this manner, the AEWs trough was identified where the meridional wind at the vertical level of the AEJ is equal to zero, indicating that the wind shifts from northerlies to southerlies (Diedhiou et al., 1999). The existence of two distinct tracks of the AEWs: the northern and southern tracks (e.g., Diedhiou et al.,

1999; Nitta and Takayabu, 1985; Reed et al., 1988; Wu et al., 2013) have been identified by examining the vorticity structure of the AEWs (e.g., Carlson 1969 a&b; Thorncroft and Hodges, 2001; Hopsch et al., 2007) and applying the reversal of the meridional gradient of potential vorticity (e.g., Norquist et al., 1977; Pytharoulis and Thorncroft, 1999; Kiladis et al., 2006). However, these methods are limited because of the overlapping scale of AEWs with other phenomena and the significant amount of manual intervention required to differentiate between synoptic-scale AEW trough axes and localized circulation centers. As a solution to this problem, here we applied the eddy energy budget to diagnose the growth and evolution of the AEWs."

6. Comparison of our results with the previous studies- Section 3, Summary of the results, Page 16 Lines 15-18 in the version of the revised manuscript with tracked changes:

   "These are consistent with the previous studies, showing that after leaving the West coast of Africa, the majority of AEWs either (1) penetrate the subtropical Atlantic Ocean via an interaction with an extratropical trough, or (2) develop further downstream and are involved in tropical cyclogenesis (Berry et al., 2007; Chen et al., 2008)."

7. Comparison of our result with the previous studies- Conclusion Section, Page 29, Lines 4- 8 in the version of the revised manuscript with tracked changes:

   "The dust-induced enhancement of AEW through a buoyancy source was shown by Grogan et al. (2016), albeit with a different methodology (i.e., analytical and regional modeling analyses). In addition, our results agree with a case study of the Saharan dust event by a regional climate model (Bercos-Hickey et al., 2017) that showed that Saharan dust causes AEW to shift northward and expand westward."

8. Since reviewer#2 provided a full review prior to the Discussion Process, we took diligent efforts to address all the reviewer's comments in the version of the manuscript we submitted earlier for the Online Discussion Process. For instance, all the references that reviewer#2 suggested above were included in the manuscript:

   1.Francis et al. (2021) study has been added on Page 4 Line 11 in the version of the revised manuscript with tracked changes.
   2.Meloni et al., (2018) study has been added on Page 4 Line in the version of the revised manuscript with tracked changes.
   3.Bercos-Hickey et al., (2017) study has been referenced several times in the version of the revised manuscript with tracked changes, including Page 5 Line 3, Page 29 Line 10, and Page 30 Line 16.
   5.Grogan et al., (2017) study has been added on Page 29 Line 7 and Page 42 (Table 4) in the version of the revised manuscript with tracked changes.
   6.Grogan et al., (2019) study has been added on Page 4 Line 21, Page 28 Line 2, and Page 42 (Table 4) in the version of the revised manuscript with tracked changes.
   7.Bercos-Hickey et al., (2019) study has been added on Page 4 Line 21 and Page 42 (Table 4) in the version of the revised manuscript with tracked changes.
   8.Francis et al. (2020) study has been added on Page 27 Line 21 in the version of the revised manuscript with tracked changes.