Comments:

Page 1, l. 27: The term "long-term" may be a bit confusing. I would recommend the authors to clearly specify in the manuscript what they mean by using "long-term"

Page 1, l. 31: explain the acronym for NAO

Page 2, l. 19-20: "the influence of the Holocene variability … remains poorly quantified": the authors may add some references as

Cockerton et al., 2014, JGR – DOI:10.1002/2013JD021283

Di Rita et al., 2018, Nature, Scientific Reports - DOI:10.1038/s41598-018-27056-2

Hayes & Wallace, 2019, QSR - https://doi.org/10.1016/j.quascirev.2018.11.018

Page 3, l. 9: explain the acronym PSA

Page 3, l. 6: replace the coma after (Moulin et al., 1998) by a dot

Page 3, l. 1-2: I recommend the authors to mention in the abstract that the study is based on analytical approaches (including grain-size, mineralogy and geochemistry) as well as on statistical analysis

Page 3, l. 28: why is there a difference between the XRD sampling resolution (2 cm) compared with grain-size and LOI (1 cm)?

Page 5, l. 18: explain AR (Auto Regression?)

Page 6, l. 12: in the sentence " a high organic content", do you consider the LOI as reflecting the organic content? Does it mean that the uppermost part of the core contains up to 20% of organic carbon? The respective use of LOI550 and LOI950 is not very clear as described in the method page 3, l. 25-27.

I do not understand why the authors use both the LOI550 and NCIR on figure S1 since NCIR= initial dry weight - LOI550. Need clarification.

Sedimentological parameters of the uppermost part of the core seem rather different from the rest of the core: dark coloured (figure S1, left); slightly coarser grain-size; large range of variations for LOI550 and NCIR. Do you have any explanations?

Page 6, l. 16: You mentioned terrigenous supply from the watershed. Could they give some details about this supply?

Page 6, l. 16-18: "The grain-size presents a homogenous content (median (D50) = 32±8 µm". The average median is 32µm±8. Is it consistent with remote eolian supply? Add some references. On figure S1, the grain-size distribution is slightly different on the upper 10 cm. (see comment above)

Page 6, l. 19-20: I agree that chlorite and illite display an increasing trend throughout the record, but kaolinite seems to first increase between 100 and 50 meters, before varying around its average value between 50 and 20 meters. How do you explain this discrepancy between clay minerals?

Page 6, l. 20-21: How do you explain the peak in palygorskite around 6 cm, in phase with the NCIR% ?

Page 6, l. 24: I am not sure that I did understand the use of the composite section. The BAS13PA core seems to be the most detailed sequence and most analyses were performed on P4, but all radiocarbon analyses except one were performed on the BAS13P1. Please clarify.

Page 7, l. 8: (and Figure 2a) CaO seems to correlate with granodiorite watershed while K_2O seems to correlate with Quaternary deposits. What is the main composition of these Quaternary deposits?

Page 7, l. 30-31: I would rather say, "This lake system is ideal for recording centennial variations of atmospheric inputs" according to the well-constrained chronology of the core

Page 8, l. 8-10: " The I/K ratio is typical of Saharan sources (so PSA1 or PSA2)..." "the low value of C/K is typical of western Sahara (PSA2)…"

But in details, according to figure 4:

- **The I/K ratio mainly varies between 1 and 1.6, suggesting that Sahara is the main source of dust, pointing out PSA1 (1<I/K<2) as the main provenance** (except ca. 2650 yr. cal. BP, 2150 yr. cal. BP, and between 900 and 700 yr. cal. BP when I/K is below 1, suggesting some sahelian supply from PSA3 (0.3<I/K<0.7), and except ca. 2400 yr. cal. BP and in the most recent part of the core when some influence of PSA2 (I/K>1.6) cannot be ruled out);

- **The C/K ratio varies between 0.2 and 0.8, suggesting western Sahara as the main source, with PSA2 (0<C/K<0.8) (and PSA3 with 0.2<C/K<0.9) being the main dust supplier.** The C/K ratio reached 1 in the uppermost part of the core, suggesting potential contribution of PSA1 (C/K=1.5) - why PSA3 is ruled out as a contributor?
- **The increase of palygorskite throughout the whole time interval may indicate enhanced contribution of sahelian source as PSA3** which is not consistent with the I/K and C/K ratio

How do you reconcile these apparently contrasting results (I/K indicating PSA1 as the main provenance, C/K suggesting PSA2 as the main source)?

Could you add the Sahel-Sahara limit on Figure 1?

Page 8, l. 10-13 "The decreasing trend in palygorskite (check the spelling a it appears as palygorskyte) content probably reflect progressive trend with more input from PSA1 over (? – A word is missing line 11), as also …". Why not considering PSA3 as a potential increasing palygorskite-depleted source? May be PSA1 is less rich in palygorskite compared with PSA2? Please add average percentages of palygorskite on figure 1

Page 8, l. 22-25: This sentence is a bit confusing. I suggest to modify "we used …" by "According to PCA analysis of the geochemical dataset, the ratio Fe/Ca vs. Ti/Ca and Fe/K vs. Ti/K were used in order to compare the compositions of lake sediments and associated watershed with dust deposits in NW Med…"

Page 8, l. 25-26: "These data allow to identify that geochemical composition of lake sediment is similar to non-carbonated dust samples" I do agree that the Fe/Ca vs. Ti/Ca ratio indicate a good relationship between lake sediment and non-carbonated dust (figure 2b top), but this is not obvious when looking at the Fe/K vs. Ti/K ratio diagram: the lake samples plot on a line with a nice negative correlation while dust samples display a positive correlation! Please clarify the sentence line 25-26

Page 8, l. 28: "Moreover, Fe and Ca, K contents present the same variations in lake sediments" – data not shown? I agree for Ca, but I am not convinced for K

Page 9, L. 10: "significant increase from approximately 1000 yr. cal. BP" There is one peak in the Fe signal around 1000 yr. cal. BP but if ignoring this peak, it seems that the enhanced supply in Fe started around 700 yr. cal. BP.

Page 9, l.14: "we observed an African dust increase that reached …" In the Fe record? In previously published data (give refs)?

Page 9, l. 21: I suggest adding Northern Hemisphere insolation record on figure 4 next to the ITCZ variations

Page 9, l. 24: I agree with the idea of the relationship between the southward position of the ITCZ and dust emission event if Doherty et al., 2012, 2014 mainly deal with dust transport rather than with dust emission

Page 10, l. 12: "ENSO" not shown?

Page 10, l. 13-14: the period seems to be slightly higher for dust compare with ITCZ

Figure 5: why the y-scale is different for NAO+ (seems to be vertically compressed)? Could you align the x-scale of the diagram in order to make the comparison of NAO+ with the other data?

Page 10, L. 20 and Figure 6: what is the period for cross wavelet analyses for dust input vs. NAO? It seems to be around 450-500 yr.? What is the robustness of this period considering the length of the analysed record (1000 yr.)?

Page 10, l. 30-31: "which correspond to the **period** of long-term increase in African dust " Do you mean time-interval, "suggesting that the long-term forcing through ITCZ migration have an impact on the NAO/African dust correlation" I am not convinced that your dataset evidence that the progressive southward migration of the ITCZ has an impact on the NAO/dust correlation. Could you clarify?

Page 10, l. 34: "The position of Westerlies are influenced by the NAO" indeed, modification of the Westerlies is one of the consequences of the north Atlantic Oscillation (Moulin et al., 1997)

Page 11, l. 2: The positive phase of the NAO is modelled in winter but with an impact on ITCZ during spring (april)

Page 11, l. 14: "large changes in solar radiation" What is the range of variation over the last 3000 yr.? Does this range of variations large enough to promote the proposed modifications of the climatic system? Could you consider adding a record of calculated irradiance over the last 3000 yr.?

Page 11, l. 25: “strong negative anomaly” I do not get it! Could you give additional details on order to highlight this negative anomaly on figure 7?

Page 11, l. 17-34: I am not convinced by this paragraph since I am not able to evaluate the potential impact of changes in irradiance on dust emission. May be of interest to have a look on studies about the impact of dust on surface solar irradiance since the emission of dust may modify the effect of solar irradiance on surface

Kosmopoulos et al., 2017, Atmos. Meas. Tech., https://doi.org/10.5194/amt-10-2435-2017

Alonso-Montesinos et al., 2017, Atmospheric Environment, https://doi.org/10.1016/j.atmosenv.2017.09.040

Granados-Munoz et al., 2019, Atmos. Chem. Phys., https://doi.org/10.5194/acp-19-523-2019

Page 12, l. 8: I am not convinced by the conclusion “with an increase since 1070 yr. cal. BP in response to a gradual orbitally-induced decrease in northern Hemisphere insolation”. I do agree about the long-term relationship (over the last 3000 yr.) but I disagree with the 1070 yr. inflexion point

Page 12, l. 11: “since 1070 yr. cal. BP, the NAO is dominant…”. The wavelet analysis was performed over the last 2000 yr., so you cannot rule out any influence of the NAO on the 3000-2000 yr. interval

Typo:

Page 2, l. 16: delete the extra “in” before “At the scale…”

Page 3, l. 6: replace the coma after (Moulin et al., 1998) by a dot

Page 4, l. 28: delete the extra bracket after « Aitchison et al., 2002)) »

Page 4, l. 30: delete the extra brackets “((van den Boogaart and Tolosana-Delgado, 2008))”

Page 5, l. 22: replace “Dust” by “dust”

Page 6, l. 25: delete the extra “;” after the bracket

Page 8, l. 21: I suggest to replace “with” by “:”; “while” by “and” and “watershed is” by “watershed samples are”

Page 8, l. 24: add a coma in between Sicily and Tomadin (also in figure 2, Page 21 l. 8)

Page 13, l. 10: delete the extra « ‘ » after « Barcelo’ »

Page 13, l. 13: add a space before « Berlin »

Page 15, l. 23: use lowercase for the title

Page 14, l. 26: use lowercase for the title

Page 16, l. 16: change “M.D. Loÿe-Pilot” by “Loÿe-Pilot, M.D.”, also Page 8, l. 15-16

Choose between « millennia » Page 1, l. 17 and Page 10, l. 17 and « millenniums » Page 10, l. 8

Check the spelling of palygorskite throughout the manuscript since it appears sometimes as palygorskyte

Figures:

Figure 1: Can you consider adding major winds and palygorskite percentages? Indeed the palygorskite varies between circa 5 to 20% and the PSA mineralogical signatures would help to interpret the observed variations. If palygorskite is <5% in PSA3, then you need to consider some contribution from this source area in the uppermost part of the core

Figure 2: symbols (brown diamonds and orange squares) on figure 2b are hardly readable; can you consider having the figure 2c in an individual supplementary figure?

Figure 3: the blue symbols are not readable

Figure 4: replace “palygorskyte” by “palygorskite”; add mean value for palygorskite

Figure 5: use same x- and y-scale for all 4 parameters (NAO+); check the legend Page2, l. 3-4: “labelled in white” since I do not see white labels

Figure S1: replace “palygorskyte” by “palygorskite”