

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2020-823

Anonymous Referee #1

Referee comment on "Atmospheric transmission patterns which promote persistent winter haze over Beijing" by Muyuan Li et al., Atmos. Chem. Phys. Discuss.,
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Comment on acp-2020-823:

The manuscript titled "Atmospheric transmission patterns which 1 promote persistent winter haze over Beijing" attempted to illustrate the relationship between North Atlantic oscillation and persistent haze in winter in Beijing, especially on the intraseasonal time-scale. Although the topic is interesting, many major revision must be revised.

Major comments:

- Title: Possibly, the title is not accurate. From your title, I cannot read any valuable information about the NAO pattern that you focused on. I strongly suggest you to rephrase your title of this manuscript.
- Line 17: "This study focuses mainly on the role of the NAO+ pattern, because the NAO index shows a closer relationship with winter haze frequency, especially after 1999". However, I did not find any physical explanations about this arguments that you emphasized in the Abstract and that seemed to be the reasons why you did this research.
- Line 18–20: The intraseasonal relationship between North Atlantic oscillation and persistent winter haze in Beijing may be a new finding, although the interannual relationship has been revealed by many previous studies. As you argued, the relationship between NAO and haze is stronger after mid-1990s. Thus, can you composted this relationships using the observations of PM_{2.5} concentrations? As you known, the PM_{2.5} concentrations were widely observed since 2014.
- Data and Methods: The details of composite approach should be introduced. For example, how to determine day -10, day 0 and day 4 of a persistent haze events lasting for more than 5 days? and so on.....
- Line 197–207: What is the differences between the definition of NAO and your LW03 NAO? It should be carefully illustrated and marked on Figures. Furthermore, I cannot understand the large differences of the correlation coefficients when you only change the definition of NAO. If this evident differences existed, the LW03 NAO you defined is still the NAO pattern? or something else?

- Line 207: I did not agree that the connection between haze and EA/WR pattern is weaker. The correlation coefficients, listed from Line 205 to Line 210, have little difference. In addition, Line 210–219 cannot stand, as you showed decadal changes of connections between NAO/EAWR and haze.
- Section 3.2: the discussion about intraseasonal relationship needed rewrite to be more compact and clearer.
- It might be better to move discussion about the impacts of sea surface temperature and Arctic sea ice Section Discussion, because you did not fully explained associated physical mechanisms.
- Line 478: the relationship between the subtropical Western Pacific SST and haze over North-Central North China Plain also contributed to the variation in haze of Beijing, as well as the Strengthening Relationship between Eurasian Snow Cover and December Haze Days in Central North China after the Mid-1990s.
- Most of the Figure must be improved. Especially, the country boundaries should be carefully examined.
- The language must be improved by native speaker.