The authors have conducted a very interesting study to investigate the ozone trends at different times of a day. This work includes many important details and could have important implications for future ozone air quality control. So I recommend this paper could be published after they have addressed some issues as listed below.

Major comments.

When trying to quantify the influence of meteorology on U.S. ozone trends during 1990-2014, the authors focused on two climate patterns—AMO and ONI. A new index named AMONI is also constructed. Even they have found strong correlations between the annual mean ozone with these climate indices, but the underlying physical mechanism is unclear to the readers. It may be too reckless to say US ozone is dependent on AMONI. Here are my concerns.

1. According to a new study (Shen et al., 2017), the U.S. summertime ozone is associated with a tripole SST pattern in the Atlantic and a dipole pattern in the northeastern Pacific. This raises the question that why the authors choose to use AMO and ONI. Is this the best choice?
2. The mechanism related to ENSO as proposed by Xu et al. [2017] only applies to the spring or fall season (e.g. the subtropical jet wind only explains the springtime ozone decreases in a small region in the southwest US). Since annual mean ozone is used in this study, the authors can't simply use the mechanism in Xu et al. [2017] to support their conclusion here.
3. The influence of AMO on U.S. weather varies by season and region. See Sutton et al. [2007] for more details. Also, AMO not only influence the temperature but also the subsidence, precipitation, drought and surface wind. Throughout this paper, the authors only mention the impact on temperature, which is not enough.
4. Does annual mean ozone strongly depend on temperature? It seems the authors mainly mention the influence of temperature changes when they explain the relationship of AMONI and annual mean ozone.

Minor comments.

P1 L32. Should mention that his mechanism only applies to the surface ozone.
P1 L35. We usually use "MDA8" instead of "DM8A".
P2 L1-7. The summary here is too general. Try to give more details or you can just cite two review papers (Jacob and Winner, 2009; Fiore et al., 2015).
P2 L19-24. Move this paragraph to the last paragraph of the introduction part.
P2 L25-34. These studies choose to focus on one region or one season due to potential occurrence of ozone episodes. So why should we care about the low ozone part, e.g. the ozone in the wintertime?
P3 L8-9. What is the meaning of "21.3-28.5% of data are missing"? It is unclear to the readers.
P4 L13-15. Please make it clear why you choose these two climate indices?
P4 L19-22. The summary of the influence of AMO on U.S. weather is too general.
P4 L16-23. What definition of AMO is used here? What SST product (ERSST V4 or HadISST?) is used to calculate the AMO index?
Does Fu 2015 mention that AMO can enhance the temperature anomaly and ozone production in US? They just speculate that AMO could change the ozone transport

between the north and south US. Also to my knowledge, the influence of AMO on US weather varies in different seasons. Please refer to Sutton et al. [2007].

P4 L24-30. What SST product is used here? Why the authors choose to use Nino 3.4 rather than other indices like Nino 1+2, Nino3 or Nino 4?

P4 L31-36. Please specify the detrending method here. Is there a reason that you want to subtract the influence of ONI from AMO?

P8 L33. Change "Relation" to "Relationship".

P8 L35-37. Why do you use linear detrending given the fact that the domestic NOx emissions are not linearly decreased?

P9 L13-16. The evidence shown here is not sufficient to support that positive AMONI leads to enhanced temperatures. This may be just a coincidence. None of the three references listed here can support the conclusion here.

P9 L17. Can the mechanism proposed in Xu et al. [2017] be able to explain the relationship? Xu's mechanism only applies to the springtime ozone decreases in a small region in the southwest US, while the authors here are discussing the annual mean ozone.

P9 L26-29. It is good to try AO, PDO and NAO. But there are also a lot of other climate indices. This doesn't mean AMONI is the best. See the metrics used in Shen et al. [2017].

P10 L16-24. The reason is that a heatwave swept across much of the US in 2012. The authors may need to mention this here.

P11 L9. Do you use the emissions in 2004 here?

P12 L19-27. I appreciate the author's efforts in quantifying the contribution of anthropogenic emissions and meteorological variability. But are the influences of these two processes independent? Why R is used here? Is it better to use R^2?

Reference:

Fiore, A. M., V. Naik, and E. M. Leibensperger (2015), Air quality and climate connections, J. Air Waste Manage. Assoc., 65(6), 645–685, doi:10.1080/10962247.2015.1040526.

Sutton RT, Hodson DL (2007) Climate response to basin-scale warming and cooling of the North Atlantic Ocean. J Climate, 20: 891-907.

Shen, L. and L. J. Mickley (2017a), Influence of large-scale climate patterns on summertime U.S. ozone: A seasonal predictive model for air quality management, Proc. Natl. Acad. Sci. U.S.A., 114(10), 2491–2496.