

## **Response to Comments of Reviewer A**

**Manuscript number:** acp-2019-1194

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**Title:** Aerosol concentrations variability over China: two distinct leading modes

### **Response to Reviewer A**

#### **Overview comment:**

*This paper studied the month-to-month variability of aerosol concentrations (AC) over China using a GESO-Chem model. The emission level in the model is set to a constant level of the year 2005. They found that two distinct lead modes dominate the natural variability: one is monopole mode which is related to the 3-month leading ENSO, while the second one is meridional dipole mode which is related to the NAO. The underlying physical mechanism is further analyzed. The results show that dynamical stability associated with the change of low-level convergence and planetary boundary layer height and thermal condition both play important roles.*

*Overall, the paper is well written and easy to understand. The topic is perfectly in line with ACP journal. Therefore, I recommend publishing after a minor revision.*

#### **Response to general comment:**

Thanks to the reviewer for the helpful comments and suggestions. We have revised the manuscript seriously and carefully according to the reviewer's comments and suggestions. More details could be found in the revised manuscript.

#### **Specific comment:**

- 1. Title: Since this paper focus on the internal climatic variability, the emission level is fixed at the year 2005. Otherwise, the first leading mode might show an increasing trend due to the dominate role of anthropogenic emissions according to the previous study. Therefore, I suggest a title changed to: Aerosol concentrations natural variability over China: two distinct leading modes.*

#### **Response:**

Thanks. We agree with the reviewer's comment that the natural variability of the

aerosol concentrations is discussed in the present work, however, the aerosol concentrations is mainly the anthropogenic emissions. In addition, the natural aerosols, for example, mineral dust is not included in the manuscript. To avoid the misunderstanding, we have not changed the title.

2. *Line 247 and other places: "emission" is not approximate here. How about using "transmission"?*

**Response:**

This has been revised.

3. *Line 309: month-to-month variability of AC*

**Response:**

This has been revised.