

***Interactive comment on “Mixing of Asian mineral dust with anthropogenic pollutants and its impact on regional atmospheric environmental and oceanic biogeochemical cycles over East Asia: a model case study of a super-duststorm in March 2010” by J. Li et al.***

**Anonymous Referee #2**

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This manuscript does not sound scientific because the authors choose the model which is not suitable for their simulated atmospheric condition (page 2749, line 20). The simulated result is questionable. As described in this manuscript, the NAQPMS is used to calculate gas chemistry. NAQPMS employs an aerosol thermodynamic model (ISORROPIA1.7) to calculate the composition and phase state of an ammonia-sulfate-nitrate-chloride-sodium-water inorganic aerosol. However, during the dust event, a huge amounts of particles in large size existed in the atmosphere, the gas-aerosol

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equilibrium definitely cannot be achieved. Forcing that the gas-aerosol equilibrium has been achieved would result in more nitrates partitioning in the particulate phase, further increases the amount of liquid water and eventually promotes sulphate formation and Fe solubility. This reviewer suggested that the authors should choose a model in which the gas-particle kinetic equations are used to calculate the mass transfer. This reviewer also has some specific comments for authors' considering.

1) Page 2745, line 6, what does it mean “complicated air pollution”?

2) This reviewer suggested the authors presented more analysis and discussion on their results, now the important part which this reviewer believes only accounts for ~25% of content in the whole manuscript. (2) Page 2745, lines 20 and line 23; Page 2748, line 10, line 19; Page 2749, line 10: Cited reference should be listed in a right order. (3) Page 2746, lines 10-15, the citation is questionable, please double check.

(4) From Page 2751, line 15 to Page 2752, line 12, the part is totally misleading and please double check. (7) Page 2756 line 18, What's the difference between TSP and total TSP? (8) Page 2757, how to distinguish Dust-SO<sub>4</sub><sup>2-</sup> from Anthropogenic-SO<sub>4</sub><sup>2-</sup> in the total SO<sub>4</sub><sup>2-</sup>. More discussion is needed.

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