Atmos. Chem. Phys. Discuss., 13, C664–C665, 2013
www.atmos-chem-phys-discuss.net/13/C664/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric processing of iron carried by mineral dust" *by* S. Nickovic et al.

Anonymous Referee #2

Received and published: 19 March 2013

General comments Numerical predictions of iron mobilization in dust during atmospheric processing are highly uncertain. The authors presented a regional modeling study of iron dissolution in mineral dust. For the first time, the authors apply high-resolution mineralogical map to the model to calculate the emitted iron fraction in the dust. The work conducted in this paper could contribute to improve the fundamental framework in modeling the spatial variability of iron in dust. It is of sufficient scientific merit and value to recommend publication in ACP. However, I would like to see the authors address the points I raise below before it is accepted.

Specific comments 1 Introduction

p.2697, l.2: Please correct "enhance the reduction of Fe(III)".

2 Atmospheric dust-iron model p.2699, l.9: Please complete the sentence.

p.2699, l.11: Fig. 1c shows that iron solubility cannot increase to 80% as a result of the atmospheric processing of iron. Please include the reference in the latter part of this sentence.

p.2699, l.18: The acidity (pH > 4) is not high enough for proton-promoted iron dissolution. What do you mean by "atmospheric chemical processing of iron" in the clouds? Please correct high acidic environment in the clouds.

p.2700, l.5: What is "the other"? Please clarify the difference in the chemical process between cloud processes and the other influenced by the dust mineralogy.

p.2701, l.10: Please explain the model cloud ratio. Why did you use the temperature instead of the shortwave flux?

p.2701, l.19: Please correct "structural iron" and "free iron".

p.2702, l.5: Please correct "dustproductive".

3 Simulation experiments p.2708, l.5: How much do dust mineralogy, cloud processes and solar radiation contribute to total?

p.2708, l.20: The model failed to reproduce the hyperbolic trend, because the authors neglected the influence of other aerosols originating from anthropogenic sources. A chemical transport model is able to reproduce the hyperbolic trend, when highly soluble iron-containing aerosols from shipboard sources are included (Ito, 2013). It is likely that the underestimates in high iron solubility are caused by the lack of anthropogenic aerosols.

Reference Ito, A.: Global modeling study of potentially bioavailable iron input from shipboard aerosol sources to the ocean, Global Biogeochem. Cy., 27, 1–10, doi: 10.1029/2012GB004378, 2013.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 2695, 2013.