

Interactive comment on “A soil diffusion-reaction model for surface COS flux: COSSM v1” by W. Sun et al.

Anonymous Referee #1

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I have found the paper “A soil diffusion-reaction model for surface COS flux: COSSM v1” by Sun et al very well organized and clearly written. The description of methods and their discussion of results are comprehensive and persuasive. I only have two minor issues with the paper (see below) and recommend the paper for publication after minor revision.

My first issue is the on the representation of diffusivity. The authors indicated the model tries to resolve the dual-phase transport, however, the equation (13) only resolves the gaseous phase diffusivity and no equation for aqueous diffusion is provided. Ignoring aqueous diffusion implies no COS transport for a fully saturated soil or transport is only restricted to the first numerical node. I suggest the authors to clarify this, or consider adding aqueous diffusivity explicitly. As a matter of fact, adding aqueous diffusivity

C1568

will make their model well posed under all moisture conditions, and even enables its application under freezing conditions.

My second minor issue is on their discussion of the advective effect in Page 5143. I think they should mention that change of atmospheric pressure will also affect the COS emission, just like it would affect soil emission of CO_2 and CH_4 , which were often observed in the fields and might be too import to ignore when their model is integrated in a large scale model for applications over a wide range of environmental conditions.

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C1569