

## ***Interactive comment on “The vapor pressures and activities of dicarboxylic acids reconsidered: the impact of the physical state of the aerosol” by V. Soonsin et al.***

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### **Additional reply to comments of Referee # 2**

Upon preparation of the revised manuscript we changed some parts of the text in addition to the ones of our previous reply to take into account the concerns of the referee concerning the issue of physical state.

In section 3.1 (page 20524, line 3) we changed the paragraph to:

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*Thus, we conclude that the particle after efflorescence contains a substantial amount of material which evaporates at higher rate than the stable solid. For glutaric acid, we indeed have indication of aqueous inclusions from hygroscopicity cycles performed on particles in the EDB (see Fig. 5 of Zardini et al. 2008). During the main efflorescence step only a part of the water is lost. Subsequent continuous water loss over a broad RH range is observed until the hygroscopicity cycles close. Because the same initial mass is reached for several subsequent cycles we can exclude irreversible mass loss (e.g. by evaporation) as explanation for this effect.*

In section 4 (page 20532, line 6) we changed the last sentence of the paragraph to:

*This may be an indication that literature data of solid succinic acid might be compromised by the presence of not well crystallized material, i.e. crystalline structures with a high defect number, or solvent inclusions.*

In section 5 (page 20533, line 15) we changed some phrasing in the second paragraph so that it reads now:

*Another general conclusion concerns the scatter of vapor pressure data in the literature when measuring dicarboxylic acids in their solid state. Above we have shown that the vapor pressure of an effloresced glutaric or succinic acid particle decreases over time scales of days for slowly evaporating micrometer size particles. Our explanation for this behavior is that the particle only slowly transforms during evaporation to its thermodynamically stable crystalline structure or depending on the water content of the efflorescing particle, solvent inclusions increase evaporation rate. This observation supports our view that the difference between different measurements reported in the literature are at least partly due to the lack of control of the physical state of the samples under investigation. We have shown for succinic and glutaric acid, that depending*

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*on the particle history of the sample, vapor pressures deviating by more than one order of magnitude can be obtained. If from such data vapor pressures of the supercooled melt are derived, the error will be propagated. Vapor pressures of solids determined from vapor pressure data of the aqueous solution at saturation conditions seems to be more robust, see Fig. 13. This emphasizes the special importance of performing vapor pressure measurements in the aqueous state.*

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