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Comment

## ***Interactive comment on “Impact of $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ coating and ice crystal size on radiative properties of sub-visible cirrus” by P. Räisänen et al.***

**Anonymous Referee #1**

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### General comments

This paper examines the impact of sub-visible high-level clouds on shortwave and long-wave radiative fluxes at the top of the atmosphere. Such potential impact has been investigated thoroughly during the last 10 years for pure ice. The originality of the study is that authors focussed on the impact of ice particles coated with an  $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$  over layer. The authors also revisit the impact of small ice particles. It has been already treated without the assumption that ice crystals are spheres. To me, the part investigating the impact of acid sulphuric coating on radiative fluxes is sufficient to write a good paper. Hereafter, are some more general comments on how the whole manuscript could be improved.

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1) This work is based on recent laboratory experiments that are not explicitly discussed in the paper. These laboratory experiments are referred in proceedings that it is difficult to consult. This is an important point that should be developed in the present paper to convince the readers that the H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O over-layer is realistic.

2) The second part of the study deals with the impact of very small ice particles. The assumption that very small particles may persist in such clouds is not well established. Is it based on the hypotheses that sulphuric acid coating could reduce the growth of the ice particles as mentioned at the end of page 5238? This should be discussed more precisely.

3) Authors conclude that the over-layer impact is small on the radiative fluxes at the top of the atmosphere. This conclusion is right if H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O coating does not modify the life cycle of such clouds. There is however a direct potential impact on the microphysics of the clouds since the over-layer can slow down the growth of the crystals. There is also a potential impact on the radiative budget in the vicinity of the cloud. These two impacts can in return modify the dynamics of the cloud and its lifespan. The authors should show and discuss the vertical profiles of heating rates (or the vertical profiles of radiative fluxes) modified by the presence of H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O coating. Then they will be able to discuss these potential impacts.

End of comments.

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 5231, 2006.

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