**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "A statistical proxy for sulphuric acid concentration" *by* S. Mikkonen et al.
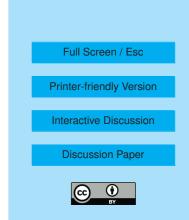
Anonymous Referee #1

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The manuscript "A statistical proxy for sulphuric acid concentrations" tries to find good parameterizations for the estimation of H2SO4 concentrations when no direct measurements are carried out. In general, the study is based on good quality observations and the methods are sound. It does not provide significantly new insights, but combines earlier observations in easily usable form definitely helping in other future studies (see also the general comment below). It can be published after the questions & suggestions given below are properly addressed.

A general comment on the results:

One of the findings is that a simple proxy, based on radiation and [SO2] only, is able to predict [H2SO4] almost as accurately as the more complicated parametrizations. As such simple proxy is more widely applicable, it should be used in stead of more

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complicated ones (requiring measurements of particle size distributions).

So please focus on proxy L3 in the discussions.

Abstract:

- please add in the abstract the actual parameterization equation together with the validity range of the parameterization. This validity range should preferable include: - Temperature range, RH range, altitude range, SO_2- and H_2SO_4-range, solar radiation range - types of the environment where the proxy is applicable (continental urban, rural, climate conditions, industrial etc, but not e.g. marine, arctic, night etc). This is to prevent the use of the proxy in areas/conditions where it is not tested. Please include this also to "conclusions". Best would actually be to include a small table giving the validity range & conditions of the parameterization. - Please indicate that in the final proxy, Hohenpeissenberg is used for proxy validation only, not for actual proxy creation. - Focus on the simpler proxy, as the more complicated provides little extra value compared to the increased number of measurements (& troubles) needed.

Intro: Page 20146, row 7: "also" - "in contrast" would suit better

Data:

- Add in Table 2 the 5% and 95% percentiles for all variables to provide information on the validity range of the parameterizations - Add the temperatures for the periods.

Page 20148, row 1: The use of the median radiation is somewhat confusing - I would prefer the use of daily maximum radiation as it more clearly describes the situation, location and season - especially as the authors only utilize the data from the light periods. Or is it the mean radiation for light period only?

Experimental:

Page 20148, row 22: please remove word "innovative" Page 20148, row 23: "allows"

Page 20151, row 7: reference to a wrong figure

Page 20151, row 25-27: Correlating H2SO4 with CS x RH is problematic, as H2SO4 variation follows solar radiation and RH daily temperatures (which are also correlated with solar radiation). Please check e.g. correlation of [H2SO4] and T x (CS)ˆ-1 - what is the correlation coefficient now? Thus, this argumentation is on somewhat loose bases. This is also proven by the quality predictions of the proxy L3 not including RH, and Fig 5.

Table 2: Please add T and 5% & 95% percentiles

Please, add a table describing the validity range of the parameterization. Show the two parameterizations given in conclusions at the top of the table.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 20141, 2011.