**Atmospheric
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Interactive comment on "Mapping the uncertainty in global CCN using emulation" *by* L. A. Lee et al.

Anonymous Referee #3

In this paper the authors use emulator technology to assess the dependance of uncertainty in predicted CCN on some identified aerosol model parameters. The benefit of such a technology is the ability to step away from, as the authors call it, 'one-at-a-time sensitivity tests'. The applicability of this technique should be highlighted to the community and i feel the paper is valuable in that respect. I only have a few general questions and minor remarks as listed below.

One key thing to note is that the knowledge gained from such an uncertainty analysis is of course entirely dependent on the model to which it is applied. In that regards it seems to me that multi-model intercomparisons are still valuable. The authors are careful in extrapolating results from this study, presenting it as a demonstration of a techhnique. This point shold perhaps be re-iterated in the abstract if im being petty.

I do not have a great understanding of emulator technology but one thing that isnt

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clear is, what uncertainty is introduced by using them? Are there typical % errors one might expect in estimating CCN concentrations using probability theory? Presumably predicted points have been verified using the full model as displayed in figure 1 and the training points represent effectively boundary conditions for each parameter. There is some discussion in section 3 but examples would help. Given the general readability of the journal a schematic would help if available/appropriate.

Do the authors have an idea as to how many parameters this technique would handle to assess sensitivity to? Presumbly the standard model approach is needed before approriate parameters are defined and as the number of parameters increases, the required number of training set parameters increases?

Minor comments.

Page 14092 line 10, typo 'Lee11', same on line 13 and in other places.

On page 14102 the authors write:' In such cases we have no idea whether poor model performance is simply due to neglect of a plausible part of the parameter space, which can now be fully quantified using the emulator.' Am i right in thinking that this still dosnt mean the emulator can be used to assess whether the model framework, the collection of all encompassing processes, is sufficient to reflect true atmospheric uncertainty?

Section 3. I would suggest placing the equations on individual lines rather than in the main body of text.

What is the 'defined critical level' mentioned on page 14094 line 12?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 14089, 2012.