**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "The contribution of anthropogenic aerosols to aerosol light-scattering and CCN activity in the California coastal zone" *by* D. A. Hegg et al.

Anonymous Referee #3

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General comments:

The paper investigates the contributions of natural and anthropogenic sources and processes to aerosol light scattering and CCN activity by means of receptor modeling. The manuscript is an addition to previously published work by the authors. It is an interesting and good to read paper, there are two main concerns: a. the use of PCASP data as a CCN surrogate, and b. the robustness of the receptor modeling results because of the small number of observations. However, I recommend this paper to be published after consideration of the comments listed below.

Specific comments:

P11488, lines1-6: PCASP data are used as a surrogate for CCN, consequently the relationship between PCASP and CCN is important and needs to be discussed in more detail. For the CARMA-IV data set PCASP concentration was found to explain 69% of CCN variability. The authors state that "…the variance structure of the CCN proxy is clearly similar to that of the CCN, …". It is correct that the proxy explains a large part of the CCN variability, but a substantial fraction of the CCN variability remains unexplained. The implications of this unexplained fraction should be discussed. A scatter plot of PCASP vs. CCN including the regression line should be included. How do the residuals look like? Is the $R^2=0.69$ due to random variability of the two instruments, or is the linear model incomplete?

P11488 and P11490, use of PMF instead of UNMIX: The arguments why using PMF instead of UNMIX are not clear and therefore not convincing. For this data set the "edge point" detection of UNMIX seems appealing and was successful for the CARMA IV data set. With PMF an additional marine factor was found, the scores of this factor were combined with the scores of the first marine factor for source apportionment. So it is unclear why using PMF here. Instead of deciding in favor of one of these two models the authors should consider to apply both receptor model approaches. As for CARMA IV, the results of CARMA II and III could be compared. This would give some indications about the robustness of the results which is important as the number of filter samples used for receptor modeling (21, 29 and 24 for CARMA II, CARMA III and CARMA IV, respectively) is at the very low limit.

P11485, lines15-19: "To address the general problem of aerosol source attribution various analyses of variance techniques (ANOVA) have long been employed…". Aerosol source attribution analyses as performed in this paper and in the cited publications are not based on what is typically understood as ANOVA but on multivariate statistical methods. The authors should change this accordingly.

P11490, lines17-18: "…PMF is well known to produce additional, secondary factors compared to the UNMIX model.". Include one or more references that support this

statement.

Figures 4-6, and Figures 10-11. At the y-axis of Figures 4-6 and in the legend of these figures the term "surrogate CCN (0.3%)" is used. Where is the "0.3%" coming from? It seems from the slope of the linear regression of PCASP against CCN. If so, it should rather note "30%" instead of "0.3%".

Table2: In Table 2, the intercept (+/- uncertainty) should be given as well. Without intercept it is not possible to see if the model prediction is systematically different from the measurements. The legend of Table 2 should be changed to something like "Values of R2, slope and intercept for linear regression of measured aerosol properties onto those predicted by the PMF factor scores." The confidence level of the given uncertainty interval should also be given.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11483, 2010.

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