Authors' answer to Reviewer 2

We thank the reviewer for critical and constructive comments on our manuscript. Please find below Authors' answer to Reviewer 2.

Review, general comment:
The authors apply a very interesting methodology which was originally introduced by Kulmala et al. (2011). The goal is to estimate nucleation mode particles over South Africa by using proxies which are constructed with geophysical parameters derived from satellite data. I very much support the development and reporting of such type of studies. It is a real challenge to gain information about processes related to new particle formation derived from satellite measurements and relate it to ground based measurements. Also, to use a combination of sensors onboard A-Train constallation as data source is an adequate input and forward-looking for such purposes. Generally, the use of synergistic observation in combination with in-situ data enable to launch excellent science.

However, the work presented here obvioulsly discloses the inadequateness of the currently suggested proxies for describing the processes in focus. The results should be carefully and critically explored, which has not been done. A creative analysis of other proxies which could substantially influence the results is missing. Although the region of interest was changed and in addition the formulation of proxies was slightly changed it is clearly shown that results don't improve significantly. When reading the current manuscript it seems that the authors would like to introduce these results as an improvement as compared to the earlier article by Kulmala et al. (2011) (which I believe is not intended at all by the authors). The results presented here demand further discussion if it is possible to derive the envisaged goal from using these proxies and most importantly how results can be refined. In my opinion the presented approach is in the early development stage and defenitely requires further treatment. Furthermore, I would recommend to include more critical and constructive aspects in the overall discussion, e.g. to consider additional properties. I would like to encourage the authors to rewrite the manuscript to do justice to the complexity of the given research topic. In summary, I cannot recommend the manuscript in its present form for publication in ACP.

Authors' Answer:
We agree with the Reviewer that in its current form the manuscript might give an impression to the reader that the results presented in the manuscript would be an improvement to the work done by Kulmala et al. (2011), which indeed was not our intention. The main point in the manuscript is to test the performance of the proxies using actual satellite data, which was proposed in Kulmala et al (2011), but not carried out in practice. We have now critically evaluated the manuscript and it has been rewritten in many parts. More discussion have been added e.g. about the uncertainties related to the satellite -based proxies, which remains one of the major issues in this kind of applications. We have also included a new section where the performance of the proxies are tested using in situ data, to see how well the proxies overall are able to predict the number concentration of nucleation mode particles over South Africa.

We feel that the critical comments from both Reviewers have improved our manuscript, and clarified the presentation of the results.