

## Response to Referee #1

>> The paper reports on interference from SO<sub>2</sub> on ozone measurements in ozonesondes in Mexico City. Clear impacts are seen from the Popocatepetl plume, and a less clear profile exhibits interference from the Tula Industrial Complex plume. Unfortunately, the method is not new and there is no new development reported. In fact, Morris et al., which is cited in the paper, goes beyond what is reported here to use the interference to measure SO<sub>2</sub> as well as O<sub>3</sub>. The interest of the paper is therefore more as a case study of SO<sub>2</sub> plumes than as a measurement technique which would have been appropriate for Atmospheric Measurement Techniques. My impression is that focusing on the SO<sub>2</sub> plumes would make a more interesting and more coherent paper in a more appropriate journal.

The paper was actually submitted as a case-study work to a different journal whose major scope is not measurement technique, but was rejected because the editor regarded it a work on measurement technique recommending AMT as an alternative journal. From the comments we have received so far, the paper seems to fall in the middle of case study of SO<sub>2</sub> plume and technical report on ozonesonde usage. The paper may not be right in the scope of AMT, but we think it may be appropriate to include this kind of paper in AMT. We would like to leave the final judgment to the editor and the referees.

>> Only a few of the profiles are reported in this paper it might be good to present more of the data to show the difference between the interference and no interference days.

Fig.4 in the revised manuscript shows all the profiles of the measurements in November 2011.

>> Page 302, line 19: The modeling section could be a separate section. From what is reported, it seems that some estimate could be made of SO<sub>2</sub> concentrations. The modeling section could be expanded to evaluate the simulation of the volcano plume if the paper were rewritten as a case study. Along these lines, it was not clear to me what the purpose of the green curve in Fig. 6 was. This could be expanded within a more thorough modeling section to estimate the impact of the Tula sources.

Unfortunately, meaningful estimate of SO<sub>2</sub> concentration was not feasible because the past report (Grutter et al. 2008) found order-of-magnitude variation in the emission rate over a month and also because the OMI satellite passed only once over Mexico City around 20 LST on November 23. We inserted a sentence explaining this point.

The green curve in Fig.6 represents the shape of the profile if the emission had been at such a level that caused the observed ground-level concentration at SMN. The approximate agreement of the observed and calculated profiles implies that the theoretically predicted plume evolution when the emission source was assumed at the Tula complex is consistent with observation. We inserted a sentence emphasizing this point.

Our original manuscript used to be longer in the modeling section, but because the other referee strongly requests reduction of the whole manuscript, we find it difficult to expand the modeling part any further.

>> Fig 3: Im not sure that taking the log helps understand what is going on.

Log was suited for showing the whole distribution in single panels. However, it is certainly helpful to be able to see the distribution in the linear scale. Therefore, we modified the figures to nested ones: the outer nest adjusted to the maximum occurrence count, and the inner nest adjusted to reveal the difference in the occurrence counts at high concentration.

>> Figs 9 & 10: Would these not look better as windroses?

The figures are changed to wind roses.

>> There are not enough citations of existing literature. For example there have been more studies of the emissions of Tula. In the introduction there could be some more references to health effects where those are mentioned, and more links to past studies in Mexico City.

For the Tula emission, Almanza et al (2012) and de Foy et al (2009) are added. For the health effects, the relevant part has be omitted following the recommendation by the other referee. For the past studies in Mexico City, the overview of the MILAGRO campaign by Molina et al (2010) that include a comprehensive review of other past studies is added.

>> There is a need for more proof reading and editing.

The manuscript will be corrected by a professional editing service.