**Atmospheric
Chemistry
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Discussions

# *Interactive comment on* "How to most effectively expand the global surface ozone observing network" *by* E. D. Sofen et al.

**Anonymous Referee #2**

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My overall impression of this study is that it provides a very unique, thoughtful and valuable analysis of the representativeness of the present-day and (hopefully) future ozone monitoring network. As described below the paper needs a revision but I think my recommendations can be more or less easily addressed. My only major concern is the handling of the mountain top sites when determining the footprint of each site.

Major comments:

Regarding the method of determining the region represented by each station, how is terrain taken into account? For a marine boundary layer site the method seems straight forward and reasonable. But what about a high elevation site like Mauna Loa? GEOS-Chem at 2x2.5 degrees cannot resolve the terrain of Mauna Loa. As far as

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the model is concerned Mauna Loa Observatory is floating in the free troposphere at 3.4 km. This site is clearly representative of the lower free troposphere and not the marine boundary layer. If you use the model to compare ozone at the surface at that latitude and longitude you will be looking at the marine boundary layer, not the lower free troposphere. The same is true for land-locked high elevation sites like Zugspitze. The authors need to address this problem.

The writing style of this paper is too "chatty" and is better suited for the lecture hall rather than a research publication. A good example is on page 21028 where the change in the composition of the atmosphere is referred to as a global scale experiment. I understand the analogy and this is fine to say in a lecture to grab the attention of your audience but of course humans clearly are not conducting an organized experiment on the atmosphere, the change is a by-product of human activity.

P21027 line 4 Here you say that expanding the ozone monitoring network will benefit the development of policy. This is a science paper and not a policy paper and without explicit considerations as to how the expanded network would benefit policy development the paper should steer clear of making such a statement. A better statement would be "would provide a significant long term benefit to our understanding of the composition of the atmosphere, information which will also be available for consideration by air quality control managers and policy makers"

Page 21032 The biome analysis is nice but from the figure it's difficult to tell the degree to which the various biomes are monitored for ozone. Please provide a table that lists the biomes and provides the percent area covered by the ozone monitors.

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Minor Comments: if no explanation is given for a comment please insert the suggested text into the appropriate place in the manuscript.

P21026 line 24 the models

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p21027 line 6 Tropospheric ozone is an air pollutant that impairs human respiratory function and damages both crops and natural vegetation.

P21027 line 10 What do you mean by prediction, are you talking about model estimates? If so you should say: "the accurate model estimation of the concentration of observed tropospheric ozone is. . . ."

P21027 line 21 ozone is inadequately measured

p21027 line 26 Scientists make conclusions based on data but data don't make conclusions by themselves. ". . ..instrumentation provides an essential validation/verification of these remotely sensed observations."

Page 21028 line 1 coverage of surface ozone observations in problematic.

Page 21028 line 21 No site, urban or rural, can be representative of global ozone, a site can't even be representative of hemispheric ozone. So here just say that urban sites are not representative of regional conditions.

Page 21028 line 24 . . .data are held by many individual PIs Line 24 . . .do not provide long term observations Page 21029 lines 3-8 This paragraph needs a lot of work: ". . .from the perspective of surface coverage, biosphere/atmosphere interactions, chemical regimes and chemical transport model evaluation. We then assess the best locations for new sites to improve our understanding of surface ozone and we conclude with a list of locations that we argue would best expand our observing capabilities."

Page 21029 line 11 The first sentence is not necessary, just begin with: "An idealized surface ozone network would provide. . . ."

Page 21030 line 1 The sentence beginning with "A similar approach" is just repeating what you said in the previous sentence. Delete this sentence and simply reference Henne et al in the previous sentence.

Page 21031 line 14 Would sound better as: How useful are these sites for observing

the. . ...

Page 21031 line 22 Drop "so"

Page 21032 line 1 Drop one of the onlys

Page 21032 Replace so with therefore

Page 20132 line 15 Not sure what you mean by "an uncertain chemistry". Please re-phrase.

Page 21036 The last sentence has structural problems

Page 21044 line 14 South America

Page 20144 line 20 straightforward

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 21025, 2015.