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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Total Solar Eclipse of March 2006: overview" *by* E. Gerasopoulos et al.

E. Gerasopoulos et al.

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We would like to thank the reviewers for their insightful comments that have really helped us improve this final version. Their suggestions have been taken into account and all raised issues are answered one by one. Technical corrections and all other minor comments are also implemented in the manuscript. Below is a point by point answer to the comments:

Response to Anonymous Referee #1

1a. For an overview paper, the introduction and section 2 seem to be the most critical to get right so that the scientific motivation for this campaign is made clear and the component scientific research investigations in the special section make sense in terms of both the overarching theme(s) and the specific scientific objectives. In this sense, I think the subsections of section 2 need to be reordered. In particular, section 2.3 on Objectives needs to come earlier, certainly before section 2.2 which describes

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experimental setups, since surely the scientific objectives drove the experiments rather than the other way around.

Section 2 has been rearranged accordingly.

1b. It would also be useful for the authors to devise some kind of traceability matrix that individually connects science objective to individual experiment(s) to scientific finding(s), thus explicitly demonstrating some degree of end-to-end closure and hence scientific successes of the campaign. Figure 9, for example, does a reasonable job of succinctly summarizing the science findings. Yet, in light of the above, this figure would benefit from another panel beside it which cites the various component research papers of the special issue and connects them via arrows to the science result illustrated in this figure. Similarly, it would be useful, either in this figure, in section 2.3, or in a separate table, to list the science objectives and to directly connect them to the component science investigations in the special issue. Other possibilities exist of course: the general point being that I think the paper could be rewritten in parts to do a better job of tracing the integrated research campaign from science objective, to research investigation, to science findings, leading to the final picture in Figure 9.

Following the reviewer's comment we have added Table 3 supplementary to Fig. 9, in which science objectives were linked to the component papers in the special issue.

2. Figs 1, 2, 3 and 6 look like low-quality bitmap images simply downloaded from public web servers where crude plots of data are routinely made available for quick initial looks. Is this true, and if so, shouldn't publication-quality versions be created from final data fields of verified scientific quality? Are there possible copyright issues in using any of these downloaded figures in this paper?

Figure 1 is just a map showing the experimental setups used in the campaign, produced via Google Earth, on which certain eclipse info add-ons are superiposed using *.kmz files by NASA/GSFC. Figure 2 is a surface pressure map created via NOAA site on which we have drawn frontals from UK MetOffice. Figure 3 was produced

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with special processing and software after downloading raw image data from MODIS site. Finally, figure 6 is a total ozone map downloaded from the official WMO Northern Hemisphere Ozone Mapping Center. The source of these images guaranties their scientific quality, and they are commonly used in scientific literature. Concerning copyright issues the source of all images is mentioned in the caption and special acknowledgements are included.

3. The paper makes liberal use of URL addresses. In many cases a "hard" scientific reference seems more appropriate. In particular, the dynamic nature of the web meansthat many of these web sites will eventually go "stale" as computers are retired and URL addresses move, making these links useless to future readers: a problem that hard scientific citations do not suffer from. Consider seriously replacing URLs wherever a hard scientific reference is available in the literature.

We agree with the reviewer that in many cases web sites may not be valid in the future due to URL changes etc. So we have tried to remove some of the URLs retaining only those linking to information not vital for the scientific part of the paper e.g. networks, laboratories and other addresses.

4. In reviewing the research of the special section, the authors in every case cite the Discussion (ACPD) paper. Most, if not all of these papers have been peer-reviewed, revised, and then published in the journal proper (ACP). Please revise this paper to ensure that all cited special section papers are the peer-reviewed ACP versions wherever ACP versions of those papers are available.

References have been updated to include the final peer-reviewed ACP versions

5. The writeup currently deals poorly with mathematical symbols: for example, terms such as "fmin","foE" etc. (P17669,) and JNO2 etc. (P17675) need to be redrafted as italicized mathematical symbols, subscripted/superscripted where necessary, and have their physical meaning explained during first usage in the paper.

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The physical meaning of all terms has been included in this revised version at first use of each symbol. We have not changed the format of the ionospheric symbols since they are commonly used this way and also to retain the same symbolism with the accompanying paper by Zerefos et al., (2007) in this issue.

6. Terms "percentages","partiality", "magnitude" and "obscuration" are all used to define the amount of local eclipsing without ever being defined or differentiated. This might be OK if these were just working terms, but in parts of the paper hard numbers are assigned to these terms (e.g. P17676 L21, P17679 L17). What precisely, then, do these numbers mean? It is not clear whether the authors are aware, for example, that "magnitude" and "obscuration" have very specific definitions for eclipses, and differ in value from one another: "magnitude" ("obscuration") refers to be percent obscuration of the solar disk diameter (surface area). The authors need to make these definitions clear from the outset, especially given the introductory nature of this paper, and make sure that the percentage numbers they quote pertain to the correct eclipsing parameter in each case.

Following the reviewer's comment we have now used the correct wording to refer to the amount of local eclipsing. In general, we have retained the term "eclipse magnitude" the definition of which was already given in Table 2 caption.

7. Page 17665 L11: Eclipses are not "myths!"

It has been rephrased.

8. L14: I do not understand what you are trying to say in this sentence. The phrase "directly related" is the confusing part.

The phrase has been removed.

9. Page 17671 L1: can the reader assume from this that the 8 okta cloud coverage prevented ground-based optical eclipse measurements at this site?

The influence of thin Ci cloudiness was obvious on the variation of total solar radiation

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(see Founda et al., 2007, this issue), however the eclipse effect was well demonstrated.

10. Page 17672 L25: is this ground-soil temperature, ground-level atmospheric temperature, atmospheric temperature some height above the atmosphere,...?

We have clarified this issue in the manuscript by mentioning the height of the temperature sensors.

11. Page 17673 L20-22: I have no idea what scientific point(s) you are trying to convey in this sentence. It needs to be rewritten to make the meaning clear.

It has been rewritten as suggested by the reviewer.

12. Page 17674 L4: I think this physical response to the eclipse was nicely demonstrated also by Segal et al. (1996).

We have added the suggested reference.

13. L24: This WRF response is inconsistent with the last sentence of section 3.1.1 which claims WRF did not simulate any dynamical response to the eclipse.

The reviewer is absolutely correct and we have clarified the first sentence as follows: "Finally WRF did not simulate any significant impact of the eclipse on the horizontal wind field."

14. Page 17676 L7: what does "around the maximum sun coverage" mean here? Do you mean maximum eclipse magnitude, maximum solar irradiance, maximum solar zenith angle,...? Same applies to "100% sun coverage" on P17685 L4.

We have replaced all similar expressions referring to the eclipse total phase with the term maximum eclipse magnitude since this is the quantity used in the paper.

15. Page 17679 L1: what does "symmetric increase" mean here: i.e. "symmetric" with respect to what?

This sentence has been rewritten as follows "During the course of the eclipse, a gradual

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drop in total ozone followed by a symmetric to the drop increase after totality is seen."

16. Page 17680 L1: From my reading of the Eckermann et al. [2007] paper, they claim to have verified the reality of the eclipse-induced gravity wave using a first-principles GCM simulation, rather than the "equivocal" null finding attributed to them here. Perhaps the authors are referring to their argument that the wave amplitudes are small, which might make this wave hard to detect experimentally? Some clarification here would be helpful.

The reviewer is absolutely correct that the way it was written we attribute them a null finding, when we have been referring to the fact that the small wave amplitudes make observational evidence difficult. We have made the appropriate change.

17. L19: what does "inside the BL manifold factors" mean? At a minimum the undefined abbreviation "BL" (boundary layer?) needs to be explained here.

This sentence has changed to " due to the modest amplitude of these waves and the manifold rationale inside the boundary layer." BL explanation has been included.

18. L25: the following five sentences need to be moved to the Introduction.

Each section dealing with different aspect of eclipse impacts has its own introductory part, while the main Introduction has been more general. Under this scope we would prefer to keep the discussion as is.

19. Page 17685 L10: the first part of this sentence claims no variation, while this latter part is quoting a fairly large range of variation. Can the authors clarify this in revision?

There has been a certain range of Chl-a concentration values in the vertical profile varying from 0.14 to 0.19 μg l-1, which however presented no significant changes during the eclipse. It has been rephrased as follows: "The vertical distribution of phytoplankton fluorescence (Chl-a concentrations) ranged between 0.14 to 0.19 μg l-1, presented a small chlorophyll maximum between 40 and 60 m, however no significant eclipse induced changes were observed (Economou et al., 2007)."

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20. Page 17686 L4: I have no idea what the phrase "both resulting to attenuating with height changes in the reflection heights" means.

Rephrased as follows: "Both photochemistry and dynamics result to changes in the reflection heights and the electron concentrations, and these changes are less pronounced at higher ionospheric altitudes."

21. L7: A wave generated in the ionosphere that propagates downward will also have wave amplitudes that increase with height (decrease with downward propagation) due to this same density effect. So how does this differentiate between a wave generated either lower down or higher up? It seems to me that it does not.

We agree with this comment. Based on the density effect one can argue only on the vertical propagation of the observed oscillations. Their direction is concluded from the full set of their determined characteristics (Zerefos et al., 2007). The text is properly modified to eliminate any misunderstanding.

22. Page 17695 L5: you surely cannot really mean altitude of the Sun here (i.e. 1 AU)? Do you mean solar zenith angle? You should cite the source of these data in this caption: e.g., is it Espenak and Anderson [2004]?

"Altitude" is the angle an object is above the horizon while solar "zenith angle" is the angle measured at the earth's surface between the sun and the zenith. Data source cite is now included.

23. Page 17702: The size of the text in this figure is very small and impossible for my aging eyes to make out.

The text in the figure has been resized.

24. Page 17703: Explain the color scale.

The color scale explanation appears in the figure with appropriate labels.

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