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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.

Anonymous Referee #1

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1 Summary

This paper provides a useful synopsis of the combined research work and scientific results of an observational campaign in and around Greece during the March 2006 solar eclipse, described in a series of research papers collated as a special issue of *Atmospheric Chemistry and Physics* (ACP). The current paper is therefore appropriate as an introduction to the special issue and I would recommend it be accepted contingent upon appropriate responses to the comments that follow.

While overall the paper is fairly well written, there are a number of issues to be addressed. The organization of the paper could be better, with emphasis on defining science objectives first, then resulting experiments, leading to science results that address the original objectives. Nomenclature is also a bit sloppy in places, with mathematical

symbols poorly defined and standard eclipse measures such as “magnitude” and “obscuration” used interchangably without any definition of these terms for the reader nor any effort to distinguish among them. Finally, there are numerous grammatical errors and confusing sentence constructions. Since my experience with ACP is that there is no formal copy editing process beyond the public peer review provided online, I have flagged those than inhibit the scientific information transfer. There are a lot of others which, for the sake of brevity, I have not listed. I would encourage the authors to carefully proofread the final version prior to final publication in ACP, perhaps marshalling a colleague whose first language is English to help with this.

These issues are expanded upon in the following two sections, with science comments first, followed by a list of simpler (mostly grammatical) corrections.

2 General Scientific Comments

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

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

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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.

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?

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 means that 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.

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.

5. The writeup currently deals poorly with mathematical symbols: for example, terms such as "fmin," "foE" etc. (P17669,) and JNO_2 etc. (P17675) need to be redrafted as italicized mathematical symbols, subscripted/superscripted where necessary, and

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have their physical meaning explained during first usage in the paper.

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.

Page 17665 L11: Eclipses are not “myths!”

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

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

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

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.

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

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.

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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.

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

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.

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

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

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?

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

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.

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:

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e.g., is it *Espenak and Anderson* [2004]?

Page 17697: what are the contour labels? Pressures in hectaPascals presumably?

Page 17701: again, what are the physical units? Please make clear in the caption.

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

Page 17703: Explain the color scale.

Page 17704: What exactly does "on a vertically stratified environment" mean here? Is this just a roundabout what of saying "as a function of height?"

3 Grammar/Typos Etc.

Page 17664 L12: you need to define the abbreviations "1-D" and "3-D" before using them for the first time.

L13: delete "models."

L22: *Recorded* observations?

L26: calendars..

Page 17665 L1: delete "etc."

L21: "have been" → "were"; "touristic purposes" → "tourism."

Page 17666 L15: "have been" → "were."

Page 17667 L11: insert "had" before "decreased."

L23: Consider the following rewrite: "Scientists from several institutes and university laboratories worked together to..."

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Page 17668 L3: insert “at” after “sites.”

Page 17669 L8: insert “the” before “Huang.”

L17: I don’t really understand what “imposed” means here with respect to ionospheric physics. Do you mean “communicated?”

L18,19: delete commas.

Page 17670 L6: purposes.

Page 17671 L7: “has started” → “began.”

L12: delete “area.” See also L19, L22.

L19: “are” → “were.”

L23: insert “the” before “southeastern.”

Page 17672 L21: “Greek domain” → “Greece.”

Page 17674 L11: “has been” → “were.”

L13: “report” → “reported.”

L18: “eclipse total” → “total eclipse.”

L28: insert “the” before “total.”

Page 17675 L11: “has been scarcely investigated in previous studies” → “has been investigated in only a few previous studies.”

L17: “NO_2 was accumulated .. in absence..” → “NO_2 increased ...due to the absence..”

P21: “the maximum of” → “peak.”

Page 17676 L1: insert “the” before “nitrate.”

L2: “during” → “at.”

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L21: “partiality” → “eclipse magnitude.”

L24: “flux” → “fluxes.”

Page 17677 L16: “performances” → “performance.”

Page 17679 L15: “in” → “at.”

L21: “hypotheses” → “hypothesized.” Actually, the more appropriate reference for this hypothesis is the original modeling work of *Chimonas* [1970].

L23: period after “(GWs)” then start a new sentence with “This has triggered....”

Page 17680 L2: Zerefos et al. (2007) is not in the reference list.

L14: “both towards” → “into both.”

L19: “has been” → “was.”

L24: delete “of.”

Page 17681 L8: “value” → “values.”

L9: “atmosphere” → “ionosphere.”

L10: “...heights, then it increases...”

L23: “as indicated by time series of Dst and AE indices, respectively...”

L25: “not affected” → “not unduly complicated.”

L29: “days” → “day.”

Page 17682 L1: “..although each differs...”

L3: “bellow” → “below.”

L19: delete both instances of “the.”

L23: “In contrary” → “By constrast.”

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Page 17683 L8: “literate” → “literature.”

Page 17684 L6: delete “etc.”

L7: “put insight” → “provide insight.”

Page 17688 L3: insert “the” before “MODIS.”

L4: “image” → “images,” “process” → “processing.”

L6: “stuff” → “staff.”

4 Supplementary References

Chimonas, G. (1970), Internal gravity-wave motions induced in the Earth’s atmosphere by a solar eclipse. *J. Geophys. Res., 75*, 5545–5551.

Segal, M., R. W. Turner, J. Prusa, R. J. Bitzer, and S. V. Finley (1996), Solar eclipse effect on shelter air temperature, *Bull. Am. Meteorol. Soc., 77*, 89–99.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17663, 2007.