Prospectus for Synthesis and Assessment Product 3.3
Climate Extremes: Analysis of the Observed Changes and Variations and Prospects for the Future

Public Review Comments
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General Comments

Fang and Holdsworth GEN-1: We note that the Draft Prospectus (pp. 1-2) states that the "impact of extremes can be severe and wide-ranging"; that the "direct impact of extreme weather and climate events on the U.S. economy is substantial" but that "the evidence for increases in extreme weather and climate varies, depending on the event of interest"; "[recent and ongoing Intergovernmental Panel on Climate Change (IPCC) Assessments have evaluated weather and climate events in the context of climate change on a global basis" but "there has not yet been specific focus on those events in North America, where observing systems are among the best in the world"; and that "[since extreme weather and climate events on a global scale are regularly addressed in international assessments," this prospectus "will focus on weather and climate extremes primarily across Canada, Mexico, and the United States, including its territories" (emphasis added). The draft adds that "this report also should have particular value to ongoing free-trade agreements (Canada, U.S., and Mexico) and bi-lateral and multi-lateral agreements related to the management of natural resources in North America" (emphasis added).

While including Canada and Mexico in the scope of this Synthesis and Assessment Product (SAP) is understandable, we question why the Prospectus's focus is on all of North America. According to the SAP Guidelines, the CCSP was established by the President in 2002, and its aims are to integrate the "U.S. Global Climate Change Research Program and the Climate Change Research Initiative" consistent with the Global Change Research Act of 1990. The focus there is on global change and the U.S. To our knowledge, there is no focus therein on all of North America, although presumably there is nothing to preclude such focus. Moreover, while the list of potential authors in the Draft Prospectus appears to include some from Mexico and Canada, there does not appear to be any obvious involvement of NOAA's governmental counterparts in those two countries. We do not understand why they are apparently not included if these countries are included, and question how valuable this SAP report ultimately could be in the absence of their active participation. Without such involvement, we question how and to what extent a U.S.-sponsored assessment could report on climate extremes in those countries. If they are not involved actively, we suggest that it might be wise to limit this assessment to the U.S., particularly since the second order draft contribution of the IPCC's Working Group I includes chapters on climate extremes globally, which would include Canada and Mexico.

Response:

Limiting the area covered by S&A 3.3 to the United States is not desirable because:

1) Valuable climate data are available from Canada and Mexico.
2) Climate and weather events in countries with a common border are often interrelated.
3) As the Prospectus states, " This report also should have particular value to ongoing free-trade agreements (Canada, U.S., and Mexico) and bi-lateral and multi-lateral agreements related to the management of natural resources in North America."
4) The Lead Author list includes a research scientist from Environment Canada, the Canadian Meteorological Service, (Stewart Cohen), the lead of the Climate Section at the Mexican National Meteorological Service (Miguel Cortez), a WMO consultant for the Mexican Government (Art Douglas), a Senior Climatologist with Environment Canada (David Phillips), a recent retiree from the position of Environment Canada's Executive Director (Climate Change) (John Stone).

5) This is a US government report and, ultimately, it is the responsibility of that government to ensure its scientific integrity and usefulness, contrary to the suggestion that "involvement of NOAA's governmental counterparts" in Canada and Mexico should be considered. The report, however, will rely on the expertise of scientists associated with the governments of these two nations, in concert with US scientists. These are science experts, not policy experts. The report will be a science report, not a policy document.

Action: No change to Prospectus

Fang & Holdsworth GEN-2: This Draft Prospectus states that the "impact of climate extremes can be severe and wide-ranging" and that such extremes "affect all sectors of the economy, including agriculture, and the insurance industry" (emphasis added). According to the Guidelines for Producing CCSP SAPs, there is an opportunity for stakeholders to comment on the Draft Prospectus and the product "during the public comment period." However, the guidelines also indicate that the stakeholders should "participate during the scoping process by providing information that helps define the audience and potential uses of a product" (p. 3).

While the draft's Chronology (p. 6) does not specifically refer to a "scoping" process, it does show that there was an initial Aspen workshop in July 2005 "to bring together a number of leading scientists in the area of climate extremes and members of key segments of the stakeholder community." According to the draft (p. 3), the "primary objective of the workshop was to help frame the critical issues related" to the SAP, and it "included various aspects of the science, impacts, and stakeholders' concerns related to the changes and variations of weather and climate extremes" (emphasis added). The draft adds that "[a] specific outcome was an outline of an action plan to produce the required CCSP product." However, the Draft Prospectus does not appear to include that "outline." It should.

The draft also indicates that a second workshop was held in October 2005 "focusing more on the impacts of extreme weather and climate events for a specific stakeholder community," which it explains was the "insurance industry," *i.e.*, "insurers/reinsurers" (emphasis added). The output of this workshop "will be used to help refine critical issues the report will address."

> The meeting addressed anticipated changes in the frequency of extreme events in response to global warming; whether these changes could be bounded; and the observations needed to improve our knowledge, i.e., improve models and the statistics of extremes. Hurricanes were of particular interest because of recent, very active seasons and the large impact on the insurance industry. The workshop recognized the importance of both observations and models to accurately quantify risk. The need to better understand the natural and anthropogenic drivers of change in climate extremes was underscored" (emphasis added).

EEI and our members are stakeholders with great interest in not only the "impacts of extreme weather and climate events," but also such issues as predicting in advance such events, as well as forecasting their scope and intensity in a timely fashion. Yet apparently EEI was not invited to

participate in either workshop or to participate in the development of the "output" of either workshop. Just as importantly, there does not appear to be any indication in the draft, unlike other prospectuses (*e.g.*, prospectus for SAP 4.5), that EEI or other stakeholders will be consulted in the preparation of the report. We question the absence of such consultation, particularly since we were not included in the workshops, which apparently served as the scoping process.

Response:

1) CCSP Guidelines for preparing a Prospectus suggest a document length of 5-10 pages in length plus appendices with references and biographical information for proposed lead authors, and do not suggest inclusion of background information such as notes and outlines from stakeholder meetings.
2) The Aspen workshop outline was an early "strawman" that evolved into the draft Prospectus. All important points from the Aspen discussions are captured in the current Prospectus.
3) The 30-day public comment period on the draft Prospectus offers an opportunity for interested parties to suggest additions and modifications to the proposed content of the Synthesis & Assessment Product. We note that these reviewers have also provided extensive comments on the Prospectus for CCSP Synthesis and Assessment Product 4.5, Effects of Climate Change on Energy Production and Use in the United States.
4) The preparation of the final report will be conducted in compliance with FACA guidelines that include requirements for open meetings announced to the public at least 15 days in advance, web posting of meeting agendas and all relevant meeting materials, and the opportunity for submission of written materials by interested parties prior to the meeting.
5) The second (stakeholder) workshop in October, 2005 included many of the people involved in the earlier July, 2005 workshop.

Action: No change to Prospectus

Hakkarinen GEN-1: I consider all of the authors listed for preparation of the draft synthesis report to be excellent choices. However, since the initial portions of the outline emphasize defining climate extremes in terms of their "social, economic, and environmental impacts" (line 15, page 4, of the PDF prospectus), I would recommend adding some additional authors with specific expertise in social and economic impacts, including a "climate historian" who can write on the effects of past climate extremes in North America on society. Stan Changnon may be a good candidate for this role, or at least he would know other folks who would be good candidates.

Response:

1) Stan Changnon was asked to be a Lead Author, but was unable to join the team.
2) We feel that social and economic interests are already represented, e.g., Linda Mearns, Roger Pulwarty, Stewart Cohen, and Richard Murnane are experts in this area.

Action: No change to Prospectus

Hakkarinen GEN-2: The section of the prospectus outline about improving future understanding of climate extremes seems weak to me. I think that there should be specific analysis and discussion of the current limitations in North American observational networks for detecting various types of climate extremes, and the design components, and costs (manpower and equipment, station density, frequency of collection, etc) and schedules and metrics (how accurate must specific measurements be to detect extremes over what future time periods with what level of precision, etc.). Tom Peterson discussed some of these issues in an IPCC workshop on climate extremes that he (and I) attended in Beijing, China in 2002, but he may also wish to propose some additional authors be added to the writing team to address these issues further.

Response:

1) Note that Tom Peterson is the Chapter 1 CLA and through author team interaction will influence content of Chapter 3.
2) The current section 2.2 (Key uncertainties related to measuring specific variations and changes) seems to address the reviewer's point about need for analysis and discussion of the current limitations in North American observational networks for detecting various types of climate extremes.
3) The final report is not meant to be a Program Development Plan or a budget document, so developing specific design components and costs for manpower and equipment are not germane to this report.
4) The current section 3.4 title could be made more specific or a new chapter could be added to address future directions (with deletion of the current section 3.4); the latter is recommended.

Action: A new Chapter 4 will be added to the report entitled "Recommendations for Improving our Understanding"; section 3.4 will be deleted. David Easterling will be the assigned CLA, with the CLAs from Chapter 1, 2, and 3 serving as supporting Lead Authors for this new chapter.

Hakkarinen GEN-3: I would recommend that the report include a specific section on methods to improve the public's understanding of what climate extremes mean, how they are measured, and how they are likely to change, based on expected changes in the sophistication of measurement methods in the future. This should be more than just an attempt to explain the entire report in layman's terms in the Executive Summary, but not quite a "Climate Statistics 101" course syllabus, either.

Response:

1) The final report is not supposed to be a tutorial or an "outreach" document but a scientific assessment intended to be useful to inform the public discussion.
2) The Prospectus already covers the reviewer's points about what climate extremes mean, how they are measured, and how they are likely to change.
3) Current Lead Author David Phillips has extensive experience in promoting public awareness and understanding of weather and climate events.

Action: Agree with the importance of ensuring that the final report is clear, understandable, and not excessively technical, but make no change to Prospectus.

Legler GEN - 1: The structure of the product will make it difficult to mine the intersections between observations (Chapter 2) and modeling (Chapter 3). I'm wondering where issues such as the following will be addressed: confrontation of models to observations (how well do coupled climate models provide realistic depictions of extremes?); development and validation of appropriate model -based indices and diagnostics; assessing adequacy of current monitoring system from a modeling *and* prediction perspective?

Response:

1) CLA/LA cross chapter involvement will be fostered in product development.
2) Past experience (S&A 1.1) shows that chapter boundaries are porous and a number of topic areas will migrate to the location of "best fit" during the course of report development.

Action: No change to Prospectus

Legler GEN - 2: Chapter 2 - How will the product address the gathering and use of paleo-proxy data that provide important multi-centennial records of changes of extremes (I'm thinking primarily of drought, but there may be other extremes of interest)?

Response: Within S&A 3.3, the primary use of paleoclimatology data is expected to be in Chapters 1 and 2. The topics of drought and other climate extremes will be addressed in coordination with the author team from S&A Product 3.4, "Risks of abrupt changes in global climate", led by USGS and S&A Product 1.3, "Reanalysis of historical climate data for key atmospheric features. Implications for attribution of causes of observed changes", led by NOAA.

Action: A paleoclimatologist from NOAA's Paleoclimate Data Center will be added to the author team to strengthen the paleo presence and provide a link to the Abrupt Climate Change activity.

Legler GEN - 3: Chapter 3 - I'm somewhat surprised there is no explicit inclusion of characterizing and exploiting predictability of extremes on seasonal, inter-annual, and even decadal time scales. There is a range of predictability on these time scales; many extremes have been attributed to climate variability patterns such as monsoons, ENSO, NAO and PDO; there are numerous users and decision-makers who would utilize this information; and finally, there is a substantial community of climate researchers, forecasters (experimental and operational), climate services, and regional application centers that could contribute a great deal of information and insight to this product.

For example, the American monsoon over northern Mexico and SW United States is tied to ENSO and antecedent conditions in the Pacific and over land areas. The monsoon have been tied to drought cycles in the southwest US and to other extremes (e.g. floods) in the western US. There is some skill in predicting these events and decision makers have expressed great interest in better incorporating such predictions into their adaptive management practices. There are several research activities already in place (e.g. the NOAA RISAs) developing and exercising the interfaces between climate forecasters and decision makers, yet these vibrant activities are not well represented on the authorship team nor are the science challenges of improving predictions on these shorter of evident in the outlined chapter summaries. There is an opportunity to engage a rich research, prediction, and applications community by opening up this product to considering prediction of extremes in the context of shorter time scales.

Lastly, the probability of extremes under a changing climate will likely continue to be linked to shorter climate variations. How will this report address the scientific challenges of observing, representing/modeling, and predicting subseasonal, seasonal, interannual and decadal variability patterns under changing climate? Will we have more frequent or stronger ENSOs?

Response:

1) The focus of the assessment is the extremes themselves, but where there is a clear linkage of events to climate patterns, e.g., between heavy rainfall and ENSO events, the final report will include that in its analysis.
2) Many of the extremes that will be considered are inherently defined in terms of impacts.
3) CCSP S&A 1.3, "Re-analyses of Historical Climate Data for Key Atmospheric Features: Implications for Attribution of Causes of Observed Change", specifically addresses the question: "What is the capacity of current reanalyses to identify changes in the frequency and intensity of climate extremes, or represent seasonal-to-decadal climate variations, such as of El Niño-Southern Oscillation (ENSO) or other major modes of climate variability?"
4) CCSP S&A 5.3, "Decision-Support Experiments and Evaluations Using Seasonal to Interannual Forecasts and Observational Data", also with NOAA as the Lead Agency, is at a comparable stage of development to S&A 3.3.
5) S&A 5.3 will deal explicitly with activities such as the NOAA RISAs.
6) The author teams will work to ensure that, in areas where there is common focus and potential for overlap, respective S&A activities are coordinated and complementary.

Action: No change to Prospectus

MacCracken GEN-1: (intended primarily for Vice-Admiral Lautenbacher) The "guidelines for synthesis and assessment products" that are referred to in the Invitation to Comment as the guidelines that will be used in development of this Product seem in direct contradiction to statements that you have made regarding NOAA policies and in responding to members of the Congress who have inquired about supposed suppression of the views of NOAA scientists. Specifically, point 16 in the guidelines indicates that:

> 16. Once the CCSP Interagency Committee has determined that the synthesis and assessment report has been prepared in conformance with these guidelines and the Data Quality Act, the Committee will submit it to NSTC for final review and approval. Approval will require the concurrence of all members of the Committee on Environment and Natural Resources. Comments generated during the NSTC review will be addressed by the CCSP Interagency Committee.

Whereas you have indicated that NOAA will not limit the views of its scientists to express their views, the guideline indicates that a political level committee (i.e., the NSTC, with the CCSP Interagency Committee supporting it) will have the final say on the final version of a report that is supposed to be written by an independent scientific team (and, in particular, one that the prospectus says is to be established as an independent Federal Advisory Committee). Disturbingly, the guidelines do not even provide that the scientific authors will have any say or right of approval in any revisions undertaken in response to the comments at the political appointee level. Politicians being set up to revise the report of an independent advisory committee of leading scientists (and without their concurrence) is totally unacceptable, and would seem to be in direct contradiction to your assurances that there should not be political interference in the statements of scientists on technical issues. An added point in this regard is that point 17 in the guidelines provides no indication that any changes made in response to the NSTC review will be identified—so the political influence will be completely hidden.

Further, point 16 indicates that approval of the report "will require the concurrence of all members of the Committee on Environment and Natural Resources." As you have recently come to recognize with regard to the controversy over NOAA seeming to take an official agency position on hurricanes and climate change, agencies should not be taking stands on specific scientific issues, especially on ones that are quite controversial within the scientific community. The guidelines, as they exist, would not only require NOAA (which admittedly would have some expertise in this area) to take a position, but would also require all of the other CENR agencies to adopt the scientific position expressed in the product, independent of whether they have any expertise in the subject matter. This requirement needs to be scrapped—it is fine to have the CENR agencies concur that the process was followed as was originally called for, but it is a very serious mistake, and in seeming direct contradiction to your latest views about agencies not taking stands on scientific issues. These guidelines need to be changed—and updated to reflect that now the scientific teams are chartered federal advisory committees, and agencies should be taking their advice, and not revising or requiring it be formulated so they all can approve it.

Response:

1) This comment deals with CCSP Synthesis & Assessment approval process and not the content of the Draft Prospectus for S&A 3.3.
2) The reviewer does not suggest that the Draft Prospectus for S&A 3.3 does not follow CCSP Guidelines.
3) It should be noted that there was no attempt to apply political pressure to influence the content of S&A 1.1.
4) Each edited draft version of the report, prior to final government approval, is provided on the CCSP web site, thus ensuring traceability.

Action: No change to Prospectus

MacCracken GEN-2: Second General Comment: I would encourage the authors to also take responsibility for extremes in ocean conditions, including wave heights in nearby oceanic areas, and storm surge and wave heights in coastal areas.

Response:

The report will address extremes in ocean conditions in conjunction with extreme events such as coastal storms and hurricanes.

Action: A**n expert on wave climatologies will be added to the author team. Otherwise, no change in Prospectus.**

MacCracken GEN-3: Third General Comment: I commend NOAA for selecting a very highly qualified set of prospective authors.

Response: Comment noted.

Action: No change to Prospectus

Melvill-Smith GEN-1: In my opinion it seems only common sense to replace & prevent the destruction of forests as fast as possible. The transpiration and oxygen production can assist in

the counter active measures required to put a stop to further global warming.

Response: Comment noted -- Relevance to S&A 3.3 unclear.

Action: No change to Prospectus

Smith & Nychka GEN-1: We believe the proposed assessment does not pay sufficient attention to the statistical aspects of assessing changes in extreme meteorological events. Although the prospectus acknowledges the importance of the statistics of extremes (e.g. in line 32 of the text), this is hardly developed in the rest of the text. Yet the statistical assessment of extreme values requires specialized distributions (such as the Generalized Extreme Value and Generalized Pareto distributions), and the application of extreme value techniques in situations involving temporal and/or spatial trends is the subject of much ongoing research. Moreover, much of this research is directly motivated by environmental or geophysical problems, including the assessment of meteorological extremes. As examples of recent publications, Coles (2001) and Smith (2003) gave overall assessments of the state of the art; Cooley et al. (2006) discuss a specific application to the construction of a map for extreme precipitation levels.

It would be a pity if the report that eventually emerges from this exercise were to be criticized for lack of attention to statistics. As a guard against this, we recommend that the team of lead authors be expanded to include at least one statistician with expertise in these areas of research.

References:

Coles, S.G. (2001)
An Introduction to Statistical Modeling of Extreme Values.
Springer Verlag, New York.

Cooley, D., Nychka, D. and Naveau, P. (2006),
Bayesian Spatial Modeling of Extreme Precipitation Return Levels.
To appear.

Smith, R.L. (2003), Statistics of extremes, with applications in
environment, insurance and finance. Chapter 1 of "Extreme Values in
Finance, Telecommunications and the Environment", edited by B. Finkenstadt
and H. Rootzen, Chapman and Hall/CRC Press, London, pp. 1-78.

Response: The author team has several members with statistical expertise. However, given the importance of this area, a statistics expert will be added to the team.

Action: A statistics expert will be added to the author team.

Stobart GEN-1: The text below may be of interest

THE POSSIBLE LINK BETWEEN GLOBAL WARMING/CLIMATE CHANGE AND INCREASES IN VIRAL ACTIVITY DUE TO INCREASED CARBON DIOXIDE IN THE ATMOSPHERE

In the late 1980's I was in touch with the Carbon Dioxide Division of the US Dept of Energy, concerning the Bethesda Conference in June 1980 on The Effect of Carbon Dioxide on Mammalian Organisms. [Ref 2] A subsequent letter down played the physiological effects discussed at the conference. [Ref 3] BUT:

In a telephone conversation with the Chairman of the Bethesda Conference, a Professor at New York State University, it became clear that no attention at all had been paid to any possible effects of rising CO2 levels on Virus Activity. Thus putting a different complexion on the possible importance of rising CO2 levels than that suggested by the US Dept. of Energy's letter. Which also did not refer to possible viral activity problems.

This may be very important, as CO2 is an acid gas and virus' prefer more acid conditions. This has been confirmed recently about the Foot and Mouth Virus, Ref 4]is well documented for the Influenza Virus [Ref 5], and may well also apply to the EBOLA and SARS Virus'. [Ref 6] This form of "life" passes through many "generations" in a short time scale, and is therefore much more likely to "mutate" under the stimulus of more "benign" (acid) conditions. Than Mankind, or any other air breathing species, with much longer "breeding cycles".

Increasing CO2 in the atmosphere might cause changes in breathing rates, and other problems [Refs 7, 8, 9 & 10] Also a lowering of blood stream pH ? The latter would in theory encourage viral activity. [Ref 2 & 6] Especially in warmer conditions. However as far as can be determined the foregoing was not a subject at the 1998 International Conference on Emerging Infectious Diseases at Atlanta, USA. {Ref 11]. HIV [Which is not affected by pH changes] and Climate Change were subjects for discussion. A number of individuals and organisations listed in the programme and abstracts would be worth consulting. And concerns have been expressed recently on the increased acidification of the Oceans, with harmful effects to Marine Life. [Ref 10]

It is suggested therefore that the “biological plague” of Mankind has both a physical and a physiological problem with rising CO2 levels. [Refs 12,13] Given that Nature made mammalian life possible by using leguminous life to reduce the CO2 content of the atmosphere. Followed by "burying" it as coal, gas and oil.
The reverse could now be starting with that "locked up" Carbon being released by the life form its reduction made possible. Following an old saying that plagues contain the seeds of their own destruction.

Avian ‘Flu may be being “encouraged” by the more “benign” atmosphere that it is now living in ? Interestingly there is a “discontinuity” in Atmospheric Carbon Dioxide levels towards the end of World War I. Is it possible that due to the great quantities of CO2 released through explosives and transport fuel a “threshold” was reached which activated the “Spanish ‘Flu” virus ?

And given the intense use of coal in China, a "CO2 induced plague" is more likely to start there ?

Global Warming may be the perceived threat [Ref 14] but Virus behaviour changes a more immediate and dangerous one ?

REFERENCES

1/. Billins, Peter, British Biogen, in a workshop at the NEMEX Exhibition at the NEC, 18 November 1999. (Data on CO2 increases in the atmosphere)

2/. Effects of CO2 on Mammalian Organisms Report of a Workshop, 5-6 June 1980, Bethesda, Maryland USA, published Dec 1982 by the US Dept of Energy, ref CONF-800249 (with disclaimer) 24 US and one European scientist attended. (Undersea Medical Society Inc, 9650 Rockville Pike, Bethesda, Maryland, 20014, USA). Page 10-3 possible effects on enzyme systems which are pH dependant ? Pages 10-6 to 10-13 Malignancies reference to lymphoma and mammary gland lymphoma effects. (12 references). Page 12-2 possible changes in blood pH.

3/. Bland M K, Bailey H C, and Lipsett M J The Direct Biological Effects of Increased Atmospheric Carbon Dioxide Levels, Stanford Research Institute International, US Environmental Protection Agency, Washington DC, 1982.

4/. The last outbreak of Foot and Mouth Disease was described as "more virulent". The atmosphere has about 12% more Carbon Dioxide in it than in 1967. Is there any link here ? NFU President, Ben Gill, confirms that the virus is "pH sensitive". (Private Communication

5/. Beyer W E P, Ruigrok R W H, van Driel H & Masuel N, Influenza Virus Strains with a Fusion Threshold of pH 5.5 or lower are inhibited by Amantadine. Archives of Virology, vol 90, pp 717-181, pub Springer-Verlag. (Example of pH sensitivity in Virus').

6/. See http://www.meridianinstitute.com/newslet/Vol7-3/7-3.html

7/. NIOSH recommendations for Occupational Safety and Health Standards. Morbidity and Mortality Weekly Report Supplement, 34:No.1S, 1985.

8/. Characteristics of Information Requirements for Studies of CO2 effects Water Resources, Agriculture, Fisheries, Forests and Human Health. Ed. White M R, DOE/ER-0236, US Dept of Energy, 1985.

9/. Organic Claustrophobia, an association between panic and Carbon Dioxide. Freinhar et al. Int. J Psychosom, 34(2) 18-9, 1987.

10/. Experimental Induction of Anxiety, the case of Carbon Dioxide, Greiez E, Encephale Nov-Dec 1987, 13(6) 335-9 (36 references)

11/. International Conference on Emerging Diseases, March 8-11 1998, Atlanta, USA. (A lot of

un-answered questions)

12/. See http://www.royalsoc.ac.uk/news.asp?id=3250

13/. Beneveniste, Dr Jaques, Effect of dilute solutions in Human Blood Streams, published in Nature, July 1988, and reported in the Daily Telegraph Magazine, 29 October 1988.

14/. Stobart A F The Greenhouse Effect and the Cost of Pollution, Talk given in October 1986, published in The Scorpion May 1987, and in Energy World March 1988.

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October 1999, revised April 2001, August 2002, April 2003, August 2004 & April 2006 e & oe.

Response: Comment noted -- Relevance to S&A 3.3 unclear. This topic is possibly relevant to CCSP S&A 4.6, "Analyses of the effects of global change on human health and welfare and human systems", that will be prepared with EPA as Lead Agency.

Action: No change to Prospectus

Specific Comments

Legler Page 1, Line 3-4: The product is not titled very appropriately. Climate in the CCSP context includes a comprehensive set of conditions, including the state of atmospheric composition as well as *all* phases and components of the water cycle (including the ocean). A more appropriate title for this product would be “Weather Extremes under Changing Climate: Analysis of …” or “Weather and Climate Extremes: Analysis of ….”.

Response:

1) The intrinsic relationship between weather and climate is discussed frequently in the Prospectus and will be prominent in the final report.
2) The Chapter 1 title is "Why weather and climate extremes matter", and the Chapter 2 title is "Observed changes of weather and climate extremes".
3) However, to more explicitly recognize the linkage between weather and climate as suggested by the reviewer, a title change will be made.

Action: The Synthesis and Assessment Report title will be changed to “Weather and Climate Extremes in a Changing Climate”.

MacCracken Page 2, Lines 4 and 16: I would urge that the spatial domain of the report be better defined. Equating "North America" with "Canada, Mexico, and the United States, including its territories" seems rather artificial. I would urge that the coverage include all the way south to Panama and all of the Caribbean (with the US having Puerto Rico and the Virgin Islands, much of this area is already covered). This would not only make the domain more integrated geographically and meteorologically, but would also provide valuable information for the many island entities in the Caribbean that would benefit from such information.

Response:

1) The Prospectus states that this CCSP Synthesis and Assessment Report will focus primarily on weather and climate extremes primarily across Canada, Mexico, and the United States, including its territories, but this does not mean that relevant information from other areas cannot be considered.
2) The Caribbean is included as one of the regions of focus.

Action: No change to Prospectus

MacCracken Page 2, Lines 10-13: As indicated in the general comments, I would urge inclusion here of oceanic conditions, including wave height and storm surge height in coastal areas. I would also encourage inclusion of variables such as wind speed to give a sense of changes in the maximum wind speed experienced.

Response:

The report will address extremes in ocean conditions in conjunction with extreme events such as coastal storms and hurricanes.

Action: An expert on wave climatologies will be added to the author team. Otherwise, no change in Prospectus.

Legler PAGE 5; lines 8-9: "… to better understand and reduce uncertainty OF PREDICTIONS and PROJECTIONS OF the frequency and severity of future climate extremes"

Response:

Sentence currently reads: "It also will include a recommendation on steps to better understand and reduce uncertainty about the frequency and severity of future climate extremes". The reference to

“reduce uncertainty” will be eliminated and the reference to “predictions and projections” will be incorporated.

Action: This sentence will be changed to: "It also will include a recommendation on steps to better understand the frequency and severity of future climate extremes and improve the predictions and projections of those extremes."
