

Unified Synthesis Product: Global Climate Change Impacts in the United States (2nd Draft)
 January/February 2009 Reviewer Comments and Responses (Final Revision, 4/23/09)
 Comment Type: BR – Blue Ribbon Panel, G – U.S. Government, P – Public

EXPERT COMMENTS

Type	Page	Side	Line	Specific Comments	Responses
BR	Gen			Ocean Acidification: This issue continues to be treated in a way well below its likely importance. While this may be unavoidable as there have not yet been extensive assessments, I think the issue really deserves more attention in the Executive Summary, in the Key Findings (at least some bullet needs to mention ocean acidification), in the Recommendations (where there appears to be no call for research on ocean acidification and marine ecosystems, etc.), and throughout the text. While the Monaco Declaration (downloadable from ftp://ftp.cea.fr/incoming/y2k01/orr/declaration/) which deals with climate change has come out after the deadline for the references you cite, the meeting did take place before the deadline and most of the presentations from the “Second Symposium on The Ocean in a High-CO2 World” are now available at http://www.scor-int.org/High_CO2_II/Program_and_PowerPoints.htm . These materials might at least be referenced.	The discussion of ocean acidification has been substantially expanded. We have added a paragraph on ocean acidification in the <i>Global Climate Change</i> Section. We have also added ocean acidification to key messages in <i>Ecosystems</i> and <i>Coasts</i> sections and included it in Recommendation 1 in the <i>Agenda for Climate Impacts Science</i> Section.
BR	Gen			Impacts on the Southeast: My general impression in reading through the sector sections is that the Southeast was seldom an example that was mentioned—basically, everywhere else seemed to get mentioned, but not the Southeast. Given the severe types of impacts that region is likely to experience, I think the region deserves more mention as an example in the sections dealing with sectors.	We have addressed the Southeast with a number of examples in the <i>Transportation, Society, Energy, and Human Health</i> sectors (e.g., New Orleans, Atlanta).
BR	Gen			Overall impression: This version is significantly improved from the previous version. It has achieved an excellent balance between presenting the science and being very readable and accessible to a broad audience. I think the effort put in to providing details in the citations and notes has been particularly useful. The authors are to be highly commended for the overall report that has been generated.	Thank you.
BR	Gen			Use of the word “conflict”: I suggested in my review panel comments that the word “dispute” or “disagreement” should be used in discussing the likely situation within the US. This comment was apparently not accepted, but I want to repeat it. On page 10, line 43, “conflicts” is used to mean, it seems to me, the type of situation in Darfur—real, violent confrontations—and I am fine with use of that word on this page. However, I am very uncomfortable having that word used back in the text (e.g., page 48, left column, lines 25 and 28; page 132, line R22; page 133, lines L2 and L30-31)	We are comfortable with the use of conflict in this context. We do not think that, as used in this report, it implies physical violence.
BR	Gen			Summarizing the Key Findings for the Regions: I found it helpful to have the summary	We again considered this suggestion but,

				messages up front for the sector sections of the report. I would reiterate from my review panel comments that I think it would be helpful to do for the regional sections of the report. I have appended at the end of the comments a copy of the table that I generated from the findings of the US National Assessment and that I think has proven helpful in explaining the report. I'd like to suggest some sort of update of this table be prepared for this report—perhaps to accompany the Key Findings, which focus on the sector results.	largely because of their compact nature and space limitations, have decided not to include an additional summary for the regional sections.
BR	Gen			General comment: the report has improved significantly. There are still a few areas that are, however, extremely problematic. I am disappointed by the many places where my earlier comments were not taken on board. I urge the authors to fix these, since not to do so would damage what would otherwise be a good report. I make specific suggestions below.	The report has undergone major revisions based on new comments and also on issues remaining from the earlier review period.
BR	7	L	18	[L18 to L19] It seems to me it would be helpful and appropriate to start this sentence with the phrase “Operating under the legal authority of the Global Change Research Act of 1990,” to make clear that there is a legal reason to be doing this.	We have considered this suggestion, but prefer to keep the current phraseology, as it is a simple and direct answer to the question posed in the section heading.
BR	7	L	22	I assume this text will be changed for final publication.	The recommended change has been made.
BR	8	L	18	[to L19] The explanation of why mitigation is not included is too short and too weak. Please make clear that there is no implied preference for adaptation as a strategy over mitigation. Please state that you have not conducted the NECESSARY analysis of the balance between adaptation and mitigation, so this report is limited in its breadth and scope. Please state that most scholars suggest that BOTH mitigation and adaptation will be required. See also my comment below regarding page 15.	This issue of mitigation has been carefully evaluated in light of this and other comments. As a result, we have expanded our treatment of mitigation through revisions in the <i>About this Report, Executive Summary</i> and <i>Concluding Thoughts</i> sections, as well as other areas in the text.
BR	8	L	38	[to L41] I am disappointed that my previous comment was ignored. I repeat it here: Please also drop the assertion that ‘adaptation options are of special interest because they have the potential to affect the impacts of current and future climate variability and change’? So too does mitigation have a vast potential to affect the future - which is why leaving it to such a low level is not a good approach. Please drop the statement on lines L38-41 which suggests that adaptation has been adopted as a pathway of choice.	The text has been revised in response to this comment with regard to both adaptation and mitigation.

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BR	8	L	40	I would suggest changing “affect” to “moderate.” I made suggestions such as this throughout my review panel comments and it appears that few of these changes were made. It seems to me that the words “affect” and “effect” really have little meaning and it would greatly help the reader here and throughout the report to use a verb that indicates the sign of the expected effect.	The recommended edit has been made.
BR	8	R	11	Change “something” to “an outcome”	The recommended edit has been made.
BR	9	L	22	As is evident by comparing the temperature records after the Krakatoa and the Pinatubo eruptions, the minimum temperatures reached after major volcanic eruptions are rising, indicating that volcanic eruptions and natural variations cannot, on the long-term scale, completely mask the human influence. What I suppose is meant here is that the masking could occur to the increase in the human influence over a decade or so (e.g., the last ten years)—not to the full effect of the human warming. This distinction needs to be made clear.	The text has been edited in response to this comment.
BR	9	L	29	Change “has” back to “have” as you had it in the review version—there are multiple subjects.	The recommended edit has been made.
BR	9	L	45	Change “shortages” to “scarcity”—water is always short in the West, so better to say that will be exacerbating scarcity.	The recommended edit has been made.
BR	10	L	16	I am again disappointed that my previous comment was ignored. It is not logical to say that unanticipated effects are likely. Likely has a specific meaning of 2/3 chance of happening and it would be impossible to say that you can assign a probability on something that is unanticipated. All you can say is that they are possible. Change likely to possible on line 40 and line 41.	We have changed ‘likely’ to ‘possible’ in response to this comment.
BR	10	L	25	Change to “would also affect” (I’ll go with affect here).	The recommended edit has been made.
BR	10	L	39	Change to “differences in assumptions about population”—make clear these are assumptions.	The recommended edit has been made.
BR	10	R	3	[R3 to R4] Change to read “projections that future temperature increases will be greatest”	The recommended edit has been made.
BR	10	R	6	Change to “in projections of continued”	The recommended edit has been made.

BR	10	R	48	[R48 to R49] Change to read “reduced, however, the world will experience continued climate change and resulting impacts through at least most of this century.”	“However” has been added, but we didn’t put in the time scale because that is discussed farther down in the paragraph.
BR	11	L	1	[L1 to L11] The reasons given here do not really cover the point that climate change will lag the rise in the GHG concentration.	Appropriate edits have been made.
BR	12	L	1	[L1 to L49] There needs to be, at least, mention of ocean acidification impacts on this page—preferably a bullet indicating that likely consequences in cold regions and coral reefs are likely to be particularly significant.	As noted in an earlier response, the discussion of ocean acidification has been substantially expanded in the report, including the addition of a paragraph on ocean acidification in the <i>Global Climate Change</i> Section.
BR	12	L	5	[L5 and L12] For clarity, I’d like to see “Climate changes” changed to “Changes in climate” so that it is clear that “changes” is a noun.	After consideration, we prefer to leave this unchanged. We think that “ climate changes” is clear as used.
BR	12	L	7	Delete “and” as the list continues.	The recommended edit has been made.
BR	12	L	29	The phrase “coastal cities” is too limiting—there are very likely going to be adverse impacts outside of “coastal cities”.	The sentence has been edited appropriately.
BR	12	L	38	For clarity, change to “than from any of these causes alone”	The recommended edit has been made with “factors” substituted for “causes”.
BR	13	L	28	[Figure] First, it is not clear why this figure is on this page—the text is talking about change the past century, so having a diagram that goes back 800,000 years, and then projects ahead, seems inappropriate and will be confusing to the reader. Because this figure should be included somewhere, a few comments: a. The title should be changed to “800,000 Year Record of the Carbon Dioxide Concentration” b. The caption should be changed to something like: “Observations from an Antarctic ice core extending back 800,000 years document the Earth’s changing carbon dioxide concentration. Over this long period, natural factors have caused the atmospheric carbon dioxide concentration to vary within a range of about 170 to 300 parts per million. Separate isotopic data make clear that these variations have played a central role in determining the global climate. As a result of human	a) Edited accordingly. b) Edited accordingly. c) Not done as this would make the figure too busy and distract from the central point.

				<p>activities, the present carbon dioxide concentration of about 385 ppm is about 30% above its highest value over at least the last 800,000 years. In the absence of strong control measures, emissions projected for the 21st century would result in the carbon dioxide concentration being increased to a level that is roughly 2 to 3 times the highest value occurring over the glacial-interglacial era that spans the last 800,000 or more years.”</p> <p>c. It might well be useful to indicate with bands of color when the glacials and interglacials were.</p>	
BR	14	L	14	Change “release” to “have been releasing”	The recommended edit has been made.
BR	14	L	18	Change to “changing the Earth’s climate” and then on line 20 start the sentence with “The climate”	The recommended edit has been made.
BR	14	R	18	Change to say “percent since the start of the industrial revolution” or “percent as a result of the industrial revolution”	The text has been modified in response to this suggestion.
BR	14	R	35	Change to “and for other”	The recommended edit has been made.
BR	14	R	42	[R42 to R44] This is really not well stated. Because halocarbons have long lifetimes, their absolute influence on climate (i.e., their ongoing radiative influence) will continue for a long time and so their effect on climate will not be reduced, except quite slowly. You might say would reduce their “relative influence” if the CO2 concentration keeps going up, or would reduce their “incremental influence” if emissions go down, but present wording is not really correct.	Edits were made to correct the problem but still keep the statement simple.
BR	15	L	1	Change to “increased the ozone”	The recommended edit has been made.
BR	15	L	24	Change to “a large increase in the atmospheric abundance of water vapor”	Appropriate edits have been made.
BR	15	L	27	Change to creating a “positive (or reinforcing) feedback loop”	Positive can’t be used because the general public thinks “positive” is always a good sign, but the sentence was edited to improve the structure.

BR	15	L	27	It is necessary to ensure that what mitigation material is available from previous SAPs is included here, to make clear that there is significant mitigation potential from non-CO2 greenhouse gases. Please add, after L27: “Reductions of emissions of non-CO2 greenhouse gases represent possible mitigation options. For example, recovery and destruction of the US bank of accessible hydrochlorofluorocarbons (HCFCs) is estimated to represent 0.9-1.1Gt CO2-equivalent (CCSP SAP2.4, page 23 and 31).”	We prefer not to make the suggested addition here but, as noted in previous responses, this issue of mitigation has been carefully evaluated in light of this and other comments. The discussion of mitigation has been expanded the ‘About this Report’, ‘Executive Summary’, and ‘Concluding Thoughts’ sections, as well as other areas in the text.
BR	15	L	41	Change to “leading to a local”	Appropriate edits have been made.
BR	15	R	13	[R13 to R16] I don’t understand the phrasing “potentially complex” as used here. Indeed, things are not completely straight-forward, but it is really beneficial to make reductions in the emissions of these species (well, perhaps for all but sulfate aerosols). Unfortunately, the phrasing here seems to imply that what happens will not be generally beneficial. I would suggest saying “Except for reductions in emissions of sulfur dioxide, reducing emissions of these shorter-lived species and particles can relatively rapidly reduce their warming influence on the climate, making them, along with the longer-lived species, prime candidates for mitigation efforts.”	The text has been edited and the phrase “potentially complex” removed.
BR	16	L	14	[L14 to L15] Well, we presently think that the various modes that have been identified are primarily natural, but given the varying time histories of all the various forcings and that our record is pretty well limited to times when human-induced emissions (and other forcings) were altering the climate system, there could be human influences causing at least some of what are presently considered natural variations. I would suggest deleting the word “natural.”	The word “natural” has been removed as suggested.
BR	16	L	18	figure I would change the title to “Major Factors Affecting the Earth’s Radiation Budget” or at least change it to “Major Factors Causing Climate to Warm or Cool”	The title has been changed to “Major Warming and Cooling Influences on Climate.”
BR	16	R	9	I would change “taken up by these natural ‘sinks’” to “redistributed into these other reservoirs.” I say this because these other reservoirs are not sinks—the CO2 could come back out—and indeed will come back out if we reduce emissions sufficiently. Basically—we are not destroying or permanently sequestering the carbon—so these are not truly sinks.	The text has been changed in response to this comment.

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BR	17	L	6	[L6 to L7] Change to read “to the increased concentration of carbon dioxide observed in the atmosphere”	Text changed as suggested
BR	17	L	8	[L8 to L12] Change to “There is some evidence that the oceans and land vegetation are becoming less able to take up and store as large a fraction of the annual human-induced emissions as in the past, leading to a greater fraction remaining in the atmosphere and an accelerating rate of increase in the carbon dioxide concentration.” Note that the amount being taken up is still, I believe, going up—it is the fractional amount of the uptake by these reservoirs that is decreasing.	The text has been changed in response to this comment.
BR	17	L	23	[L23 to L24] I do not understand why the phrase “made by satellites” is in the sentence—or at least why it is indicating as the leading source of the observations from which changes in the Earth’s surface temperature is determined. I think this is simply wrong—we do not have accurate enough satellite records to do this—well, they can give some indication of the pattern and how to interpolate, but not of the actual value.	The text has been changed in response to this comment.
BR	17	R	2	[R2 and R18] I do not understand why the phrase “closest to the Earth’s surface” is being used to encompass the atmosphere going up many miles (to one millibar). Perhaps, at least in the caption, say “the layers of the atmosphere that determine the Earth’s climate.” It would also help in the figure to appropriately place the word “Surface” in the figure.	The figure in question has been removed.
BR	17	R	29	I would suggest changing the title to “Global Average Temperature and CO2 Concentration” (although I do note you are saying “carbon dioxide” rather than “CO2”), so I wonder also about the present title.	The title has been changed to “Global Temperature and Carbon Dioxide.”
BR	17	R	44	[R44 to R45] I would change it to say “Red bars indicate temperatures above and blue bars indicate temperatures below the average temperature for the period 1901-2000.”	The text has been changed in response to this comment.
BR	19	L	1	I would revise it to say (or perhaps add this in a footnote) to say “virtually, impossible, although very significant changes are possible (e.g., coming out of the Last Glacial Maximum 20,000 years ago, sea level rose at an average rate of about 3 feet per century for a period of about 12,000 years.”)	The text has been changed in response to this comment.
BR	19	L	8	[L8 to L9] I would suggest saying “evidence make clear that many of the changes in climate of the past 50 years were primarily human-induced.” I am not quite sure why there was a change to “climatic changes” for “climate changes” and this should be in past tense.	The text has been changed in response to this comment. It is also changed in Key Message on p13.

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BR	19	L	33	Change to “any single study or combination of studies” to be really definitive—or say “Nor have any studies undermined”	The text has been changed in response to this comment - used the first suggestion.
BR	19	L	44	Change “paleodata” to “paleorecords” as the data are really things like thicknesses and not temperature, which is inferred. There may be a need to explain “proxy” records.	The text has been changed in response to this comment.
BR	19	L	49	Change “data” to “record”	The text has been changed in response to this comment
BR	19	R	2	[R2 to R3] Change to “Hemisphere, the recent temperature increase is clearly unusual ...” and then refer to the figure.	The text has been changed in response to this comment, but we are unsure what figure is being referenced.
BR	19	R	8	Change “predictions” to “simulations”	The suggested change has been made.
BR	19	R	28	Change “make” to “allow”	The suggested change has been made.
BR	20	L	38	Change to” “For straightforward physical reasons, models also calculate that ... has had ...” Make clear this is not just models doing their own thing, but representing what the physics indicates they should.	The suggested change has been made.
BR	20	R	22	Change to “have also found” to indicate this is all consistent.	The suggested change has been made.
BR	20	R	25	Change “atmosphere” to “troposphere”—a term that has been explained.	Thank you for your comment. We have changed from ‘atmosphere’ to ‘troposphere’ as you suggest. This makes sense given the presence of the vast majority of water vapor in the lowest 2-3 km of the atmosphere.
BR	21	L	47	[Figure] In left inset, near L47, move words “Earth’s Surface” down and add “Troposphere”. Also, where here is the plot of observed change? It would be much more effective graph if that were included.	The figure and caption have been changed in response to this comment.
BR	22	L	8	Change “as great due to” to “greater as a result of”	The suggested change has been made.
BR	22	L	47	The word “exact” is far too limiting—this sort of says what we learn about past cannot be useful. I would change this to say “close analog for the rapid changes in climatic conditions ...” or maybe replace “close” with “plausible” or “useful”.	The text has been changed in response to this comment. Replaced “close” with “useful”.

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BR	22	R	9	[R9 to R11] This sentence is really incomplete in that for the next few decades, which is to many the period of most interest, the changes are largely determined by past emissions—saying this clearly would make clear that decisions we make have important consequences for several decades (and longer).	The text has been changed in response to this comment.
BR	22	R	29	Change “will be” to “turns out to be”	The text has been changed in response to this comment..
BR	22	R	30	Change “those” to “past and future”	The suggested change has been made.
BR	22	R	44	Change “None of them” to “Most importantly, none of the scenarios” as “them” is unclear.	The paragraph containing that text has been removed.
BR	23	L	2	[L2 to L17] Very well said.	Thank you.
BR	23	L	27	I think the phrase “increase 100-fold” will be very unclear. Given that the next sentence gives an explanation, I would change this phrase to “become much more likely”	The text has been edited in response to this comment.
BR	23	L	37	Replace “This has already been observed” to “Observations indicate that this trend has already begun”	We feel that this would change the meaning to refer to a a trend in risk which is difficult to explain, so the recommended change was not made.
BR	23	R	24	Change “but” to “although”	The recommended edit has been made.
BR	23	R	36	[R36 to R41] Generally well said, except change last two lines to read “century need to be increased to substantially above previous projections.”	The text in question has been edited.
BR	24	L	8	upper figure Is there some reason that observations are not shown for this figure, at least for part of the record or some locations. Also, is this figure for over land, or over land and ocean? What would be of most interest to people is for over land—and if this is done, it should be said.	The caption has been edited. This is a global figure in a global chapter. Redoing it to just be over land would probably lead to the same results but a longer caption. So no re-creation of the figure has been made. Observations are not adequate for much in the way of historical heavy precip index and if we did use what is available, we’d have to mask the model to only those areas. So, the decision is to let global be

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					global.
BR	24	R	3	Change “climate” to “emissions”—I cannot imagine that the word “climate” is meant here.	The recommended change has been made.
BR	24	R	4	Change “it” to “they” to match change on previous line.	The recommended change has been made
BR	24	R	38	The graphs referred to are not on this page, but the next one.	This has been fixed.
BR	24	R	43	[R43 to R44] Change to read “stabilizing the atmospheric CO2 concentration at roughly 450 or 550 ...” And I would note that earlier in the report, CO2 was written as “carbon dioxide” but this is changed in this paragraph—not clear why.	The text has been change in response to this comment.
BR	24	R	47	Change “380” to “385” (or higher?)	The number has been changed to 385.
BR	25	L	47	[L47 to L49] This is a misleading statement as the offsetting effects of sulfate aerosols will be quickly lost if the concentrations of GHGs are stabilized, so the present effective CO2 concentration is about 450 ppm and we already need to bring the level down to about 400 ppm to have the likelihood of not exceeding 2 C that is indicated here. This is a very important point to be made. Otherwise, and I am starting to make this point in my geoengineering papers, the world will need to be emitting pure SO2 to sustain the offset.	We have added the following sentence at the end of the paragraph: “Reductions in sulfate aerosol particles would necessitate lower equivalent carbon dioxide targets.”
BR	25	R	3	Change “Concentrations” to “Concentration”	We prefer the plural form since several lines are shown.
BR	25	R	41	[R41 to R42] Change to say “larger changes in climate than” or should say “climatic changes”—given that the text here does in some places say “climatic conditions” or something similar.	The recommended edits have been made.
BR	25	R	45	Change to “shows” as “record” is the subject—or make it “records”	This is a close call, but we prefer the current construction.
BR	25	R	48	Change to “rapid changes in climate” or otherwise you really are using “climate change” as a compound noun.	The text has been modified in response to this suggestion.
BR	26	L	12	[to L26] I am again disappointed that my earlier comments were not included. This discussion cherry-picks the literature and is unbalanced. Other studies have suggested that lubrication of the bed may not be at all important. It is not appropriate for an	[03/30/09] Thank you for your comment. SAP 3.4, plus other papers (e.g., Alley et al., 2008, Das et al., 2008) support the idea that there is

				assessment to ignore those studies. Change the cited literature and the underlying to acknowledge that there is also evidence that these effects may not be very important; include not only those studies that support higher numbers but also those that do not, including Joughin et al., Science, 2008; Das et al., Science 2008; Alley et al., Science, 2008; and Holland et al., Nature Geoscience, 2008.	still substantial uncertainty about certain potential rapid changes in ice flow dynamics. In accordance with the reviewer’s desire for improved balance, we have added the above references to the text. The examples of ice flow dynamics were provided in response to other input. With the added references, we feel that they are well supported.
BR	26	L	28	I would like to suggest that a diagram indicating the potential for rapid change be shown, making clear that such changes are not likely to be just random, but are driven by particular feedbacks (in paleoclimatic times, processes like outflow of water from behind large ice dams, etc.). One might even show some changes occurring now as boundaries of climatic zones shift—so subtropics expanding, and so some regions are shifting into drought—leading to more wildfires.	We have considered this but decided not to attempt to develop such a diagram.
BR	27	L	9	Change to say “This tendency is projected”	The text has been edited as suggested.
BR	27	L	11	Change to say “this trend is projected” to make clear it is the tendency that is continuing.	The text has been edited as suggested.
BR	27	L	18	[L18 to L19] I assume the decision to cover only 50 years is due to limits on the data. In that in virtually every other document, the focus tends to be on 100-year rates of rise, I got thrown for a loop until I realized that this was for only 50 years. I will be recommending that, at least in the text, the rise over the 20th century, at least at the global level, also be indicated. Also I very strongly recommend that, on L19, the text here be changed to “rise much more”—the rate is already higher, and rise will continue for a couple of centuries, at least.	The numbers have been removed from the key message. Without the numbers, the need for “much” is reduced as the point is now fairly general.
BR	27	R	27	The whole document needs a check on commas. Here, there should be a comma after “global” and one after “Therefore”	The text has been edited as suggested.
BR	27	R	37	[Figure on bottom right] I think it needs to be said in the caption, presuming it is true, that there were fewer stations operating in the early 20th century, and this is why the variability appears higher. Alternatively, explain that there may have been problems with observational methodology. The character is so different, this deserves some mention. I	The US station data doesn’t change much going back at least to 1920 in the CONUS and close to 1950 in Alaska, so the peculiar appearance of the figure is not an artifact of the data as far as

				would also suggest that the dates of the global maps on the left be indicated on the global temperature figure. Also, in the caption, it needs to be explained if this is 48, 49, or 50 states—so what area is actually being covered?	we know. So no changes made.
BR	28	L	10	[L10 to L13] The text should indicate somewhere that urbanization effects have been accounted for. Perhaps start this sentence with the phrase “After accounting for the contribution resulting from urbanization, the map ...”	Urbanization has not been accounted for in these data; rather urbanization has been proven to not be a significant factor in these data. But we feel that mentioning that would only raise a “red herring” issue. So no change made.
BR	28	L	28	[L28 and R48] I think the phrases “(1993-2007)” and “(2011 to 2029)” are confusing and so is the phrasing of the caption. What is intended, as near as I can tell, is to show the change in temperature from average computed over the period from 1961 to 1979 to the average from 1993 to 2007, but what it could be misinterpreted to be is the change from 1993 to 2007, etc. It would help if the phrasing in the figure were “[average for 1993-2007 minus average for 1961-1979]” or something similar (and for other periods as well).	This has been clarified as suggested.
BR	28	L	48	Change to say “based on results from 16 climate models”	The recommended change has been made.
BR	28	R	2	Change to read “determine by the ongoing climate response to pas emissions”	We feel that the suggested could confuse a number of readers and are satisfied with the current wording.
BR	29	L	7	[L7 and R7] I think the phrases “(2041-2059)” and “(2081-2099)” are confusing. What is intended, as near as I can tell, is to show the change in average temperature computed over the period from 1961 to 1979 to the average from 2041 to 2059, but what it could be misinterpreted to be is the change from 2041 to 2059, etc. It would help if the phrasing in the figure were “[average for 2041 to 2059 minus average for 1961-1979]” or something similar (and for other periods as well).	The base period (1961-1979) is now noted in the figure title. For clarity, we have added the word ‘average’ in each subtitle year range.
BR	29	L	22	[L22 to L24] I think the phrasing will be confusing. The title says it is “Projected Temperature Change” and so the reader will be looking for the period, and what they will see is “(2041 to 2059)” and they will have to do some work to know what is meant is the “average for 2041 to 2059 minus average for 1961-1979”	The base period (1961-1979) is now noted in the figure title. For clarity, we have added the word ‘average’ in each subtitle year range.

BR	30	L	3	Change to read “This tendency is projected to continue” in order to promote clarity and to make the sentence clearly able to stand alone.	The text has been edited to clarify this
BR	30	L	25	Change “patterns” to “trends” as the patterns will be changing as the subtropics expand.	The text has been edited to clarify this.
BR	30	L	37	[L37 to L47] Well-explained.	Thank you.
BR	31	L	7	Change “clear” to “most identifiable”	We are satisfied with the language on this page as written.
BR	32	L	3	Change to say “this trend is projected” to make clear that it is the tendency that is going to continue, and not just that the 20% increase is going to persist.	The suggested change has been made.
BR	34	L	2	[L2 and L3] On line 2, it is not clear how 1961 to 1979 is present day, especially because on page 28, present day is defined as 1993-2007.	We have change ‘Present Day’ to ‘Recent Past’
BR	34	L	17	[L17 and L31/R31] In giving the years, a different phrasing is used compared to the top figure, for no clear reason. One has it “1961 to 1979” and the other phrasing is “2080-2099”—when near as I can tell, all are intended to show average over the indicated period (and not a change from some earlier period). I would suggest changing the phrasing to say “average over the period from 2080 to 2099” or something similar and compatible with other indications of the period.	We have changed the subtitles of all maps to read as follows. (1961-1979 Average), (2080-2099 Average), (2080-2099 Average).
BR	36	L	45	[L45 to L46] In that you are indicating the uncertainty in the model simulations, you should show the uncertainty in the observational record—which must be rather significant over the period indicated. You might also have a footnote that indicates why models give a range, which I assume is both because of multiple models and because of chaos. Given that Santer et al. recently chided Douglass et al. on not treating uncertainties right, the authors should be very meticulous here.	Error bars are not being added because we feel that some artifacts resulting from the way the errors are calculated would require more distracting explanation than the value of the of the error bars provide.
BR	37	L	33	[L33 and L34] Again, I think it is going to be a bit confusing to just give the 50-year change. I would also add that over the 20th century the global rise is estimated to have been 6 to 8 inches. On line 33, I would think you should be saying that “global sea level” rose by 2 to 5 inches. It is a bit confusing to have this sentence say that many US areas experienced 2 to 5 inches of rise, and then on line R10-R13 have it said that the majority of the Atlantic and Gulf coasts were significantly higher than the global average. This just seems to me contradictory (unless you are counting every last point along the coast of	We made revisions to better communicate changes along the US coast relative to the global average. Because our focus is on climate change during the past 50 years we feel it best to focus on quantitative statistics during this period.

				Alaska and the island trusts, or whatever, in estimating the total coastline)		
BR	37	R	29	figure It seems rather surprising to me that the map does not seem to show what is happening in Louisiana, given the very large relative rise.		The subsidence of land in Louisiana compounds even modest or minimal increases.
BR	38	R	33	[R33 to R36] The sentence needs to say this is for the whole US together—that is never noted here.		We have modified the sentence based on your suggestion.
BR	38	R	38	[R38 to R50] Again, this paragraph is about the US as a whole—which is not very helpful. Earlier, it is said that there is a northward shift in storm tracks, so would this not mean a shift in thunderstorm (and then likely in tornado) tracks? And what about the timing—a week or so ago when the tornadoes hit Oklahoma, the weather broadcasters were saying we were having spring-like conditions in early February—indeed, just what climate change is projected to be doing. So, are there shifts in timing and spatial distribution (looking for a change in intensity distribution may well be the wrong thing to be looking for)?		The comment makes sense, but we could not find adequate published peer-reviewed research proving this point.
BR	39	L	44	[L44 to L50] While there may be a slight upturn in extent for 2008, what is clear is that the thickness is way down, so volume is decreasing. This should seem to be something to be mentioned—as well as explaining that year-to-year fluctuations are expected.		In the paragraph next to the figure we mention both of the points the reviewer wants in the caption, and we do not feel that it is necessary to repeat that information.
BR	39	R	47	I am again disappointed that my earlier comments were ignored. This is unbalanced. Please acknowledge that sea ice is not declining in the Antarctic, and please say something about published studies.		Because the focus of this chapter is on national climate change, we have expressly avoided discussing changes that have occurred globally and in regions outside North America.
BR	40	L	11	Reference 8 just does not seem the right reference to have for this point.		Thank you for pointing this out. This has been fixed by replacing the reference with an appropriate one.
BR	41	R	24	[R24 and R25] Punctuation problems Delete comma after “altered”, insert one after “alter” and change the semicolon after “cycle” to a comma.		We have corrected the punctuation and modified this key message to be consistent with the first bullet.
BR	44	L	1	[L1 to L29] Still no mention of the Southeast—where flooding due to hurricanes might well increase, and where drought is more likely due to the northward shift of winter storms and the greater summer drying.		Due to space limitations, we cannot reference all regions, so we have focused on those regions that have the strongest model signal.

BR	44	L	46	Change “Sun intensity” to “intensity of solar radiation”—what matters is actually not so much the Sun, but the clouds.	Changed to ‘solar intensity at the ground’ as recommended.
BR	48	L	25	[L25 and L28] I will say again that I think the word “conflicts” is inappropriate—the text should instead say “disputes” or “contention”. I don’t disagree that the word is being improperly used—it is just inappropriate given the international situation, where one may well get (or already has) violent conflict, as is referred to on page 10, line 43.	We are comfortable with the use of conflict in this context. We do not think that it implies physical violence.
BR	58	L	13	I think the phrase “Index 1 = # of incidents in 1992” is very unclear. Apparently what has been done is to normalize the results to 1992, and this should be said more clearly—for example by labeling the vertical axis “Reference to 1992” or something similar. It is also not at all clear why 1992 is used as the reference—choosing any one year is really highly suspect—especially a year with the Mt. Pinatubo eruption. Maybe choose a 5-year average to normalize to.	This analysis has been completed, and we are unable to change the normalization interval.
BR	62	L	31	figure At least when I printed it out, the figure did not show the roads or rest of the map other than the coastline.	This figure now appears fine in the printed version.
BR	76	L	38	Change to “of the increasing”	We are unable to find corresponding language in the text at this location – no change made.
BR	77	L	50	Change “demanding” to “necessitating”—livestock don’t issue demands.	The suggested change has been made.
BR	77	R	16	Change to “that a higher”—especially so as to match what is done on line L21.	The suggested change has been made.
BR	79	L	6	[L6 to L21] I think it is a serious omission not to be mentioning ocean acidification in the set of key messages.	Ocean acidification has been added to one of the key messages as suggested.
BR	85	L	25	[L25 to L28] The issue of ocean acidification could be added to this key message—indeed, it may well be that ocean acidification is a bigger threat here than climate change.	We have changed the key message here to exclude wetlands and include ocean acidification.
BR	86	R	26	You could add the results of the October 2008 conference in Monaco to the references here, also maybe even listing the Monaco Declaration. Quite clearly, this issue deserves more attention. And why is the Royal Society report on this issue given prominent mention—there are plenty of references to be citing, so no excuse for the limited attention to this issue.	We have added more on this, including the two references. Ocean acidification discussion is being increased in the <i>Coasts</i> section and a direct reference has been added here.

BR	92	R	30	[R30 to R34] The caption here needs to say how the days are defined—are the numbers for the days when the heat index exceeds 100 F for one hour, 8 hours, 24 hours, WHAT???	This has been clarified.
BR	93	L	9	Change “effect” to “affect”	The suggested change has been made.
BR	101	L	7	[L7 to L17] This list of key messages fails to explicitly mention sea level rise—this really needs to be done as it is one of the most important national level impacts on societal infrastructure. I also see no mention of floods or droughts (so water shortages) or of wildfires or of hurricanes—just saying “extreme events” is too jargony. Basically, this list of key messages needs a good deal of work so it can stand alone and not seem so general.	The first paragraph has been expanded to note the examples. Sea-level rise and extremes are addressed elsewhere in the report. Key messages are linked to all of these. We have also amended the 5 th key message to include ‘such as severe storms.’
BR	103	R	42	[R42 to R44] This message could add at the end “and sea level rise”	This is supposed to be about urban vulnerability in general, and sea-level rise applies to a subset.
BR	127	R	36	[to R37] Change to read “Summer warming is projected to be larger...”	One of our Lead Authors has noted: This conclusion is correct for the Great Plains AND for nearly every other region in the continental United States. It is a function of how increasing global temperatures interact with a large continental land mass, combined with summer drying which enhances the temperature change during that season (not submitted figures).
BR	132	R	22	Again, I would suggest changing “conflict” to “disputes” or “disagreements”	We are comfortable with the use of conflict in this context. We do not think that it implies physical violence.
BR	133	L	2	[L2-3 and L30-31] Again, I would suggest change the word “conflict” to “dispute” so as not to imply physical confrontations.	We are comfortable with the use of conflict in this context. We do not think that it implies physical violence.
BR	140	R	9	[R9 to R19] It is not clear to me that the amounts of rise here are compatible with earlier estimates—I just do not see where a mid-range of 13 inches comes from, for it leaves out	This comes from a regional study that is derived from the IPCC report. A special study

				the ice movement term. Please recheck for consistency with elsewhere in the text.	by one of the Lead Authors notes a one foot increase in the vicinity of Neah Bay, Washington. We do note that ‘higher levels’ are possible.
BR	147	L	19	[L19 to L28] Not mentioning ocean acidification (and changes in ocean chemistry—even initiation of dissolution of coral reefs—and storm damage to corals, which will take longer to recover) among the stresses in the future is failing to mention one of the most important likely impacts for this “region”—basically, by 2050, the chemistry around the world is not favorable to corals, even in low latitudes—that is what the diagram on page 153 makes clear. Leaving this to be said in the coastal section is just not adequate.	This is an important topic and we are beefing it up in the <i>Coasts</i> section (which follows immediately) and <i>Ecosystems</i> . We have no space here to go into it in detail. So we are referring the readers to these sections.
BR	153	L	22	[L22 to L28] The issue of ocean acidification and damage to coral structures deserves more attention, here and up front in the findings. While there may not be a good CCSP assessment of this, there are other ones—like that of the Royal Society, etc.	We have added a paragraph on ocean acidification with appropriate references in response to your comment.
BR	155	L	22	[to p. 157] I am again disappointed that my earlier comments were ignored. I feel that this discussion is lacking in many important respects. There needs to be an added paragraph on page 155, inserted at line L22 that covers the following: “Understanding the physical climate system, not just warming (subtitle). Understanding warming is only the beginning of understanding climate change. There are many things we don’t yet know about the physical system and cannot project with sufficient confidence (even at larger scales) to usefully guide our efforts to analyze mitigation and adaptation options. This includes rainfall, storm tracks, storm intensity (extratropical and tropical), heat waves, and sea level rise. An improved understanding of how different forcing agents may be driving these factors is also essential (for example, how are changes in upper tropospheric water vapor contributing to drought? How are changes in aerosols affecting precipitation and its patterns?). A better understanding of the physical climate system is required to make lasting decisions about guidance for adaptation, for evaluation of adaptation versus mitigation, and for analysis of mitigation options.” Earlier Comment: I feel that this discussion is lacking in many important respects. There needs to be an added paragraph that acknowledges that understanding warming is only the beginning of understanding climate change. The physical side of the problem is not finished – you	Text has been added that addresses the points made regarding the need for research as discussed in this comment. The first paragraph in the Agenda for climate Impacts Research now includes the following: “Advancing our knowledge in the many aspects of science that affect the climate system has already contributed greatly to decision making on climate change issues. Further advances in climate science including better understanding and projections regarding rainfall, storm tracks, storm intensity, heat waves, and sea-level rise will improve decision making capabilities.”

				<p>need to add a clear recommendation (a new paragraph) that discusses the fact that there are many things we don't yet know about the physical system and cannot project with sufficient confidence (even at larger scales) to usefully guide our efforts to analyze mitigation and adaptation options. This includes rainfall, storm tracks, storm intensity (extratropical and tropical), heat waves, sea level rise and much more. An improved understanding of how different forcing agents may be driving these factors is also essential (for example, how are changes in upper tropospheric water vapor contributing to drought? How are changes in aerosols affecting precipitation and its patterns?). There are a very large number of essential questions that cannot be presumed to be 'solved'. If we don't make an effort to better understand these things, we will not have the basis that is required to make lasting decisions about tough mitigation options, but we need to.</p> <p>I don't think it is valid to discuss projecting climate at local scales without making clear that this requires a far better understanding of forcing and of forcing/response relationships. It is evident, for example, that Antarctic climate changes are strongly linked to circulation and forcing; soot is important in Asia, etc. The same may hold true for the Arctic and for many other climates. Please add a paragraph discussing the importance of understanding forcing in much greater detail if climate is to be projected at greater scales of detail.</p>	
BR	155	L	38	<p>Retile this section to be "Terrestrial Ecosystems" as that is all that it covers. Then add a new subsection on "Marine Ecosystems. Indeed, the present text on "Ecosystems" fails to mention freshwater ecosystems or coastal ecosystems—if the intent was to leave all this out in order to keep things brief, then the section is virtually useless, expecting the reader to know that ecosystems means so many different things. In addition, the section does not mention "ocean acidification" and its consequences—at the very least, this report needs to be calling for research on this topic.</p>	<p>We have revised the text to include mention of marine and ocean acidification issues.</p>
BR	155	R	6	<p>Regarding recommendations for future work, reference might be made to the recommendations in the US National Assessment and the Parson et al. article.</p>	<p>Such recommendations have been included in the Concluding Thoughts section.</p>
BR	156	L	24	<p>[L24-25] Change to read "project changes in climate and the frequency and timing of weather patterns at local scales." Saying "climate change" is just too vague—to do impacts, we need information on how weather patterns are going to be changing—so say</p>	<p>We have revised the text to incorporate your suggestion.</p>

				this.	
BR	157	L	5	[L5 to L43] Either in this section or by creating a sixth recommendation, there needs to be mention of the need for research on global linkages (US versus international, etc.) and international security interests that relate to national security interests in the US (there are several prominent reports on this—including a National Intelligence Estimate—to draw upon). I favor a separate recommendation about international coupling—but clearly something needs to be added on this.	We have made changes to the text to address your concern.
BR	157	L	10	[L10 to L39] Somewhere in here, mention should be made of the threat to marine life from changing ocean pH—organisms may not be able to grow shells, etc. That would be a key threshold.	We have addressed this concern in the revised text.
BR	157	L	14	(Lines: L14-21) I think it might be useful to at least make a quick reference to the research recommendations in other assessment report, including the US National Assessment (and so to that report and to the Parson et al. article), etc.	We decided to maintain our practice of not including references here.
BR	157	L	26	(Lines: L26-30) The rise in CO2 concentration and ocean acidification needs to be mentioned.	We have referenced this in the revised text.
BR	157	R	1	Recommendations for Future Work adequate? No, not in my view. Specifically with respect to the discussion of seeking to project finer scale information, what is really needed is to move also toward a finer scale in time than, roughly, decadal averages of seasonal changes. There is a real need to get beyond talking about changes in long-term averages to investigating changes in the characteristics of the weather (e.g., of the likelihood of various weather types, the locations of fronts, the paths of storms, etc.—so of all the features that really influence people, their activities, and many aspects of ecosystems. Finer scale estimates of long-term averages are not really the point—what we need are changes in finer time scale features, and this requires having better spatial resolution.	We have considered your input and made appropriate modifications to the text.
BR	157	R	1	More generally, it seems to me that a number of topics are inadequately covered in the research recommendations. For example, there is nothing really mentioned about research needs to evaluate ocean acidification and the marine food chain, or to get at how impacts outside the US will affect US interests and how changes within the US might affect the interests of other nations.	We have considered your input and made appropriate modifications to the text, including a mention of managed ecosystems.

				<p>While it is an important step to be considering adaptive measures, the rate of change of climate is rapidly getting us beyond what can be adapted to; at a recent DOI workshop, resource managers from Alaska said they were really engaged in “triage management” — that is determining how best to sustain the most important ecosystem services while accepting that some will be lost. It seems to me there need to be research efforts focused on what might be called “substitution” or “transition” to altered conditions, or, put simply, “dealing with the loss” of various ecosystem services and landscapes that we have been used to as adaptive management simply falsely implies that clever management is all we need to do—this is simply not the case. Indeed, we’ll be dealing with ongoing changes, so we need research for how best to manage in an environment that is continually changing.</p> <p>While I realize this is not the place to develop a full research agenda (the CCSP research plan and recent and upcoming NRC reports offer a number of ideas), and even though the preparation of the last CCSP research strategy appeared to pay no attention to the research areas called for in the first US National Assessment, I do think more must be said in this document about what is needed.</p>	
BR	159	R	19	Change “see” to “observe and understand”—let’s be a bit scientific here, explaining to people what we actually do.	We have changed ‘see’ to ‘understand.’
BR	162	L	7	(Lines: L7 and following) I think the vision needs to make clearer that there needs to be an ongoing effort that can on a continuing basis look into and address questions from stakeholders in order to promote the overall well-being and economy of the US. Periodic reports are certainly important, but stakeholders cannot be told to wait several years for the next assessment—they need answers soon after the question is asked—so we have to have an on-going process as well.	We have changed the sentence to read: “A vision for future climate change assessment includes both sustained, extensive stakeholder involvement, and targeted, scientifically rigorous reports that address concerns in a timely fashion.”