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- Use the **Tab key** to move to the next input field !
- You can enter up to 32,767 characters in a cell. However, Excel will display only the first 1,024 characters on the spreadsheet itself. Although longer comments will appear in full in the formula bar at the top of the Excel window, we suggest that you **split long comments into several separate rows** of the spreadsheet, with "From Page" values completed for each row.
- **If you are copying comments from another application into the review form, please either click the formula bar or double-click the appropriate comment cell before pasting your comment.**
- Do not put multiple comments in the same "Comment" cell.
- Comments must be submitted in **English**.



Review ends **30 November 2012**.

INTERGOVERNMENTAL PANEL ON **climate change**

Working Group I (WG I) – The Physical Science Basis

Working Group I Contribution to the IPCC Fifth Assessment Report

SOD Formal **Expert** Review

Expert Reviewer: Forrest Mims

No	Chapter	From Page	From Line	To Page	To Line	Comments
1	TS	1	1	99	18	"Climate Change 2013: The Physical Science Basis: Technical Summary": This is listed as a "First Order Draft." Is this correct? Should there be a Second Order Draft or is this new?
2	TS	4	42	4	43	This sentence: "It is very likely that in the Northern Hemisphere, the 1981–2010 CE period was the warmest of the last 800 years, and there is medium confidence that it was the warmest in the last 1300 years {5.3.5}." is generally

TS	1	1	99	18	"Climate Change 2013: The Physical Science Basis: Technical Summary": This is listed as a "First Order Draft." Is this correct? Should there be a Second Order Draft or is this new?
TS	4	42	4	43	This sentence: "It is very likely that in the Northern Hemisphere, the 1981–2010 CE period was the warmest of the last 800 years, and there is medium confidence that it was the warmest in the last 1300 years {5.3.5}." is generally contradicted by this sentence from Chapter 5, page 23, lines 19–21: "These few indicate that the last decades are relatively warm for the SH and at global scales (Table 19 5.1), but there is only limited evidence and therefore low confidence that the recent warming has exceeded the range of reconstructed temperatures over the last 4 centuries." These sentences appear to have been composed by different teams, which, of course, they were. The literature generally supports the low confidence of the latter sentence, and it is to be hoped that this sentence will be revised or dropped so as not to eliminate or compromise the Medieval Warming Period.
5	23	19	23	21	The following sentence (and possibly others) is contradicted by the TS citation in the previous row above (TS, 4): "These few indicate that the last decades are relatively warm for the SH and at global scales (Table 19 5.1), but there is only limited evidence and therefore low confidence that the recent warming has exceeded the range of reconstructed temperatures over the last 4 centuries."
TS	4	43	4	45	The words "and regions" that end the following sentence are misleading in that (1) many papers describe widespread warming during the Medieval Period and (2) the current warming is an average of globally distributed regions, some of which are warming some of which are stable and some of which are cooling. For example, the published records of the US National Weather Service (NOAA) clearly show the high stability of temperatures recorded across the State of Texas from 1885 to 2011. (A slight cooling trend accompanied by a decline in column water vapor of 2–3 mm/decade appears in my measurements from Central Texas since 1990.) Here is the misleading sentence: "In contrast to the late 20th century there is high confidence that the Medieval Climate Anomaly was not characterized by a pattern of higher temperatures that were consistent across seasons and regions."

TS	6	28	6	29	"Radiosonde, GPS and satellite observations indicate increases in tropospheric water vapour at continental scales,...": These assertions are unreferenced here and are contradicted by various studies that show a flattening or even reduction of total column water vapor, which is nearly all tropospheric (the stratospheric water vapor is typical only a mm or so.). This is highly significant and should be noted here. The citation to 2.5.5. will be addressed below in this review.
TS	6	29	6	31	"It is very likely that tropospheric specific humidity has increased since the 1970s.": This assertion is contradicted by the NVAP-M study, which is addressed at 2.5.5-6 below in this review.
TS	19	33	19	39	The conclusions here are based on the high solar activity since about 1910 and do not include the possibility that a significant reduction in solar activity will be accompanied by increased cosmic ray background. This is what has been occurring since the prolonged minimum between solar cycles 23-24, which is addressed below together with a suitable reference.
TS	21	2			Typo: Last word in line 2 should be changed from "of" to "or".
TS	24	38	24	39	"...larger than 0.25°C since 2001.": This is potentially confusing to those unfamiliar with the various global temperature time series. "0.25°C" applies to the entire record from 2001 to 2011 when compared to the preceding range of dates. It is important to avoid confusion by stating up front that the 2001-2011 trend is essentially flat, as noted by the mention of a zero trend quoted in the next row below:
TS	24	51	24	52	"...trend in global mean temperature since 1998 is not significantly different from zero....": While this zero trend is the consensus view, it differs with the assertion in the sentence quoted in the previous row above.
TS	25	18	25	20	The absence of any qualifier in the following sentence may subject AR5 (as with AR4) to justifiable criticism by climate skeptics: "We conclude, consistent with the AR4, that it is likely that the warming of the troposphere is attributable to anthropogenic forcings dominated by greenhouse gases. {2.4, 9.4, 10.3}" In view of the significant uncertainties involving clouds and aerosols discussed in AR5 and the absence of a trend in global water vapor (see the discussion below about the 2012 NVAP-M report), assigning a "likely" confidence level to the hypothesis that the entire warming of the troposphere is due to anthropogenic forcings is unwarranted.
TS	47	37	47	38	"The net radiative feedback due to all cloud types is likely positive, although a negative feedback (damping global climate changes) is still possible.": This sentence is troubled by its juxtaposition of "likely positive" and "still possible." In such cases it is always much better to simply state there is uncertainty. Furthermore, the use of "global" is overly broad and should be tempered by inserting "regional or" before "global". A suggested revision to this sentence is given in the row below:
TS	47	37	47	38	Suggested revision to sentence discussed in previous row above: "While the net radiative feedback due to all cloud types may be positive, a negative feedback (damping regional or even global climate changes) is still possible."
2	4	2	4	3	It is important that AR5 editors correct all unqualified statements regarding the global status of any parameter. To avoid confusion, it is essential to use a qualifier such as "globally averaged", as properly applied in this sentence: "It is virtually certain that globally averaged land surface air temperatures have risen since the late 19th Century."
2	4	52	4	53	With the exception of arctic and alpine sites, tropospheric water vapor constitutes most of the total water vapor column. Therefore, the following sentence is contradicted by the newly expanded and recently published NVAP-M study, which shows no trend in global column water vapor measured over land and

					oceans by radiosondes, GPS and a fleet of satellites: "Radiosonde, GPS and satellite observations indicate increases in tropospheric water vapour at continental scales,..." New language is proposed in the next row below.
2	4	52	4	53	The contradiction in the previous row above can be rectified by following the sentence above with the following proposed language: "These studies suggest that it is likely that tropospheric specific humidity has increased since the 1970s. However, the recently reanalyzed and expanded NVAP-M study found no trend in the global abundance of total column water vapor from 1989 to 2010." Citation: Thomas H. Vonder Haar, Janice L. Bytheway and John M. Forsythe. Weather and climate analyses using improved global water vapor observations. GEOPHYSICAL RESEARCH LETTERS, VOL. 39, L15802, 6 PP., 2012. doi:10.1029/2012GL052094.
2	4	54	4	56	In view of the improved 2012 NVAP-M findings (see citation in previous row above), the following sentence should be deleted or qualified to reflect the uncertainty reflected in NVAP-M: "Because tropospheric temperatures have also increased, significant trends in tropospheric relative humidity have not been observed."
2	13	6	13	9	Elsewhere AR5 describes the role of water vapor as the leading greenhouse gas. But here in Section 2.2 that role is missing. Instead, stratospheric water vapor is discussed, and tropospheric water vapor is relegated to Section 2.5 near the end of the chapter. Yet tropospheric water vapor has far more influence over temperature and weather than stratospheric water vapor. I suggest that words to this effect be included in Section 2.2 with a mention that tropospheric water vapor is discussed later in Section 2.5.6. It is essential for policy makers to understand the dominant role of tropospheric water vapor in regulating temperature, and I suggest that one way to acquaint them is to employ the famous quotation from John Tyndall, who wrote in 1863 that water vapor "is a blanket more necessary to the vegetable life of England than clothing is to man. Remove for a single summer-night the aqueous vapour from the air. . . and the sun would rise upon an island held fast in the iron grip of frost." Citation: John Tyndall. On radiation through the Earth's atmosphere. Philosophical Mag. 1863, 4 (25), pp. 200–206.
2	17	4	17	4	In the following sentence, "relatively accurately" is both grammatically awkward and imprecise: "AOD can be relatively accurately determined with sun-photometers...." Suggested revision: ""AOD can be accurately determined (uncertainty of 0.01 to 0.02) with sun-photometers...." The best reference (there are many) is: T. Eck , et al. 1999. Wavelength dependence of the optical depth of biomass burning, urban and desert dust aerosols J. Geophys. Res. 104 31333–50.
2	17	28	17	29	The following sentence is garbled: "The accuracy of retrieved AOD over oceans is usually better over ocean." Suggested revision: "The accuracy of AOD retrieved over oceans is usually better than AOD retrieved over land."
2	17	19	17	20	The following sentence is awkward: "Cloud screened, ground-based solar broadband radiometer measurements provide longer time-records than sub-spectral sun-photometer data, but they are less accurate." First, the phrase, "sub-spectral sun-photometer" is confusing when "spectrally selective" is what is meant. Second, comparing the "accuracy" of sun photometers with that of broadband radiometers is inappropriate, since the two classes of instruments play very different roles. A broadband instrument can very accurately measure the full sky (plus sun) irradiance while a sun photometer cannot. Here is a suggested revision: "Cloud screened, ground-based solar broadband radiometer measurements provide longer time-records than spectrally selective sun-photometer data, but broadband measurements do not permit the aerosol size

					retrievals available from sun photometer derived AOD at two or more discrete wavelengths."
2	39	18	39	24	The opening of FAQ 2.1 is misleading (see proposed revision to opening line in next row below) in that there is no mention that climate is characterized by cycles of warming and cooling. By mentioning only warming ("That the world has warmed since the nineteenth century is unequivocal."), the less informed reader might incorrectly think that the present cycle of warming is somehow unprecedented. How would scientists of past generations react to this? Consider Thomas Jefferson, who wrote in great detail about the climate of Virginia in letters and in a book. Jefferson, who measured the low and high temperature every day from 1776 to at least 1824, observed, measured and then wrote: "A change in our climate however is taking place very sensibly...Snows are less frequent and less deep...The elderly inform me the earth used to be covered with snow about three months in every year...." (Thomas Jefferson. 1782. Notes on the State of Virginia. University of Oxford.) Should not policy makers be informed that cycles of warming and cooling are common in both the historical and paleo records? The next row below offers a suggested amendment to this section.
2	39	20	39	20	Continuing from the previous row above, here is a proposed brief addition and revision to the opening line of FAQ 2.1: "Climate is characterized by alternating periods of warming and cooling. Evidence that the world is now warming comes from...."
2	47	39	47	43	After a positive discussion of various reanalysis studies of radiosonde humidity data, this closing section criticizes all reanalysis products. The obvious concern to this reviewer, who has measured total column water vapor for 22.5 years, is the absence of any mention of the 2012 NVAP-M paper. This paper concludes, "Therefore, at this time, we can neither prove nor disprove a robust trend in the global water vapor data." Non-specialist readers must be made aware of this finding and that it is at odds with some earlier papers. Many cited papers in AR5 have yet to be published, but the first NVAP-M paper was published earlier this year (after the FOD reviews) and is definitely worthy of citation: Thomas H. Vonder Haar, Janice L. Bytheway and John M. Forsythe. Weather and climate analyses using improved global water vapor observations. GEOPHYSICAL RESEARCH LETTERS, VOL. 39, L15802, 6 PP., 2012. doi:10.1029/2012GL052094.

2	44	20	47	43	ON THE SIGNIFICANCE OF INCLUDING MENTION OF THE NVAP-M PAPER AND ITS FIG. 4C IN AR5: Positive feedback of water vapor (enhanced evaporation due to warming induced by GHGs) is key to GCMs. This key fact is why the new NVAP-M paper should be discussed and cited in AR5. While the original NVAP work was criticized, this should be considered in light of published problems with all the major global water studies (see, for example, Trenberth, K. E.; Fusillo, J; Smith, L. Trends and variability in column-integrated water vapor. <i>Climate Dynamics</i> 2005, 24 (7-8), 741–758). The 2012 NVAP-M study is a significant improvement and expansion over the original study. It is also the most comprehensive, multi-sourced atmospheric water vapor study to date, for NVAP-M uses data from quality-controlled upper air radiosonde soundings; SSM/I, HIRS, AIRS satellite soundings; and GPS stations. Note that HIRS retrieves the vertical profile of water vapor over land. A timeline of instruments used for the 2012 NVAP-M paper is at ftp://ftp.agu.org/apend/gl/2012GL052094 . In conclusion, the initial 2012 NVAP-M paper well deserves discussion and citation in AR5. The citation is: Thomas H. Vonder Haar, Janice L. Bytheway and John M. Forsythe. Weather and climate analyses using improved global water vapor observations. <i>GEOPHYSICAL RESEARCH LETTERS</i> , VOL. 39, L15802, 6 PP., 2012. doi:10.1029/2012GL052094. Disclaimer: I do not know and have never met any of the NVAP team. I received one brief e-mail from a member of the team in response to a question about when the 2012 paper would be published.
2	47	8	47	11	Figure 2.31 depicts water vapor only over the oceans. Figure 4c from the new 2012 NVAPS-M study (citation given in previous row above) is much more relevant, for it is a time series of water vapor over both land and oceans from 1988 to 2009. The NVAP-M chart in Figure 4c should either replace the current Figure 2.31 or be added as a new figure.
2	49	19	49	20	"Thus water vapour at the surface and through the troposphere has very likely been increasing since the 1970s." This conclusion is contradicted by the 2012 NVAP-M paper discussed in the rows immediately above. The safest conclusion is the conclusion of NVAP-M: "Therefore, at this time, we can neither prove nor disprove a robust trend in the global water vapor data." A suggested revision to the present sentence, which assumes the addition of a mention and citation of the 2012 NVAP-M paper, would be: "In view of the opposing findings from the studies cited here, some of which are only over water, it is not yet possible to assign a trend to the abundance of water vapor in the atmosphere."
2	71	12	71	15	This conclusion is contradicted by the absence of a robust trend in column water vapor as reported and plotted from 1989 to 2010 in the 2012 NVAP-M study (citation above).
7	15	46	15	48	"One exception is that meteorological station data suggest a plateauing of WVMR near the land surface over the last decade or so, but humidity at this level exerts little greenhouse effect..." The "plateauing of WVMR near the land surface over the last decade or so" extends through the troposphere and is global. This plateauing, which can be seen in my column water vapor measurements from Texas (1990 to present), is shown to be global in nature in NVAP-M, a significant improvement and expansion of the first NASA Water Vapor Project (NVAP). The NVAP-M finding should be added to this sentence together with the reference in the following row:
7	15	46	15	48	Citation for proposed addition described in previous row: Thomas H. Vonder Haar, Janice L. Bytheway and John M. Forsythe. Weather and climate analyses using improved global water vapor observations. <i>GEOPHYSICAL RESEARCH LETTERS</i> , VOL. 39, L15802, 6 PP., 2012. doi:10.1029/2012GL052094.
7	42	44			Typo: "actiOvity"

7	43	17			"Statistically significant, but weak, correlations...": What does this mean? What is the range of the "statistically significant" correlation coefficients?
7	44	16	44	18	"The lack of trend in the cosmic ray intensity over the last 50 years...": This assertion is dated, for it is contradicted by the ongoing and historically significant reduction in solar activity. There was a significant (>5%) increase in the neutron count at Oulu during the extended solar minimum between cycles 23-24. The Oulu record began in 1964. Since the ongoing stabilization of global temperature has accompanied the reduced solar activity since about 2002, a new sentence is in order to express the fact that the significant reduction in solar activity now underway will likely increase the cosmic ray background. Please insert such language along with the reference in the following row:
7	44	16	44	18	Citation for proposed addition described in previous row: M. J. Owens, M. Lockwood, L. Barnard, and C. J. Davis. Solar cycle 24: Implications for energetic particles and long-term space climate change. GEOPHYSICAL RESEARCH LETTERS 38. L19106, doi:10.1029/2011GL049328, 2011.
10	25	50	25	51	"In summary, an anthropogenic contribution to increases in atmospheric moisture content at Earth's surface is found with medium confidence." This finding is unsupported by the 2012 NVAP-M global water vapor study. As discussed above in lines 28-40, this paper is highly significant, for it concludes, "Therefore, at this time, we can neither prove nor disprove a robust trend in the global water vapor data." Policy makers and non-specialist readers must be made aware of this finding; that it is based on upper air soundings, GPS data and multiple satellite surveys over land and sea; and that it is at odds with some earlier papers. Many cited papers in AR5 have yet to be published, but the first NVAP-M paper was published earlier this year and is definitely worthy of citation: Thomas H. Vonder Haar, Janice L. Bytheway and John M. Forsythe. Weather and climate analyses using improved global water vapor observations. GEOPHYSICAL RESEARCH LETTERS, VOL. 39, L15802, 6 PP., 2012. doi:10.1029/2012GL052094.
0	0	0			GLOSSARY: Annex III (page 21). This glossary is a nicely crafted resource, to which I suggest just one addition. Chapter 2 often uses the phrase "column integrated water vapour" rather than the equivalent phrase "precipitable water" given in the annex and in many of the citations in Chapter 2. SUGGESTION: Please add "Column integrated water vapour" as an entry that simply states "See Precipitable water." Alternatively, insert "column integrated water vapour" as an alternative phrase for precipitable water. (In my FOD review of Chapter I suggested that either one phrase or the other be used consistently, and that is now done in the Chapter 2 narrative--but "precipitable water" is still in the title of various citations in the list of references.)