Detailed Review Comments of Chapter 2 of the 4th National Climate Assessment

There is voluminous research discussing the global warming "hiatus" or "pause" during the 16-years after the previous strong El Nino 1998-2014, only ended after the most recent uptick in global temperature in 2015-2017. While the background trend is clearly warming, the "step-like" increases in temperature followed by "pauses" should not be glossed over but examined honestly. From conventional observational, satellite, and reanalysis datasets, the global warming coincident with the strong El Nino was over 0.2-degrees Celsius, similar but larger than the "jump" 20-years ago.

Key Message 1: Lines 16-23 are not entirely representative of the ongoing research into the "hiatus". The inclusion of the Lewandowsky et al. (2016) reference suggests this document is hedging toward "statistical" cherry-picking as the reasoning for short-term global warming variability. Additionally, the Karl et al. (2015) paper includes arguably questionable data methodology choices and a better reference exists using the ERSSTv5 (Huang et al. 2017).

These definitions are needlessly imprecise: "from a few years to a decade or so" and should be replaced with exact information about the length of previous "pauses" and then "jumps" or upticks in warming. The recent publication of Yin et al. (2018) in Geophysical Research Letters on the "Big Jump of Record Warming Global Mean Surface Temperature in 2014-2016 Related to Unusually Large Oceanic Heat Releases" (http://onlinelibrary.wiley.com/doi/10.1002/2017GL076500/abstract) is a useful reference as it provides an explanation for the observed warming.

Hiatus "denial" is not a good look and will not engender trust in future predictions of warming especially when leading climate scientists like James Hansen are predicting another decade long "hiatus".

(http://www.columbia.edu/~jeh1/mailings/2018/20180118_Temperature2017.pdf)

By weaving a narrative to sweep the recent warming hiatus under the rug, questions are raised about this section's adherence to the federal Day Quality Act as the misleading and imprecise nature of the analysis does not fulfill the "maximizing the quality, objectivity, utility, and integrity of information" provision of the Act.

Key Message 8: This entire section on Arctic amplification needs to be completely rewritten or excluded due to an inadequate level of analysis. Simply listing references with competing theories or contradictory conclusions is not adding value to this assessment. Some studies say this and others say that is not what should be in the Key Messages. Instead, add value, confidence or certainly levels with a chart or table highlighting the ongoing scientific disagreements for example raised at a recent CLIVAR meeting on Arctic climate change.

The section on Landfalling "atmospheric rivers" includes the nebulous term "as the world warms" to predict increases in severity and frequency. However, since these are associated with extratropical cyclone track changes, the uncertainty is quite large. These are not isolated features of the large-scale circulation but very important to the meridional transport of heat, moisture and momentum poleward. Please include some information about "weather systems" in general and how they have changed or will change in the future using the appropriate confidence or certainty levels. Atmospheric rivers are simply the conveyor belts within extratropical cyclones and should be defined more exactly.

While there is a "greater potential" of more intense tropical cyclones in the future e.g. by 2100, there is limited observational evidence or a consensus that we have already observed these changes in our historical tropical cyclone datasets. This entire section of the assessment should just be replaced with the statements at the GFDL website https://www.gfdl.noaa.gov/global-warming-and-hurricanes/ (last revised on January 24, 2018). The inclusion of aerosol linkages to changes in North Atlantic hurricane activity is speculative at best.

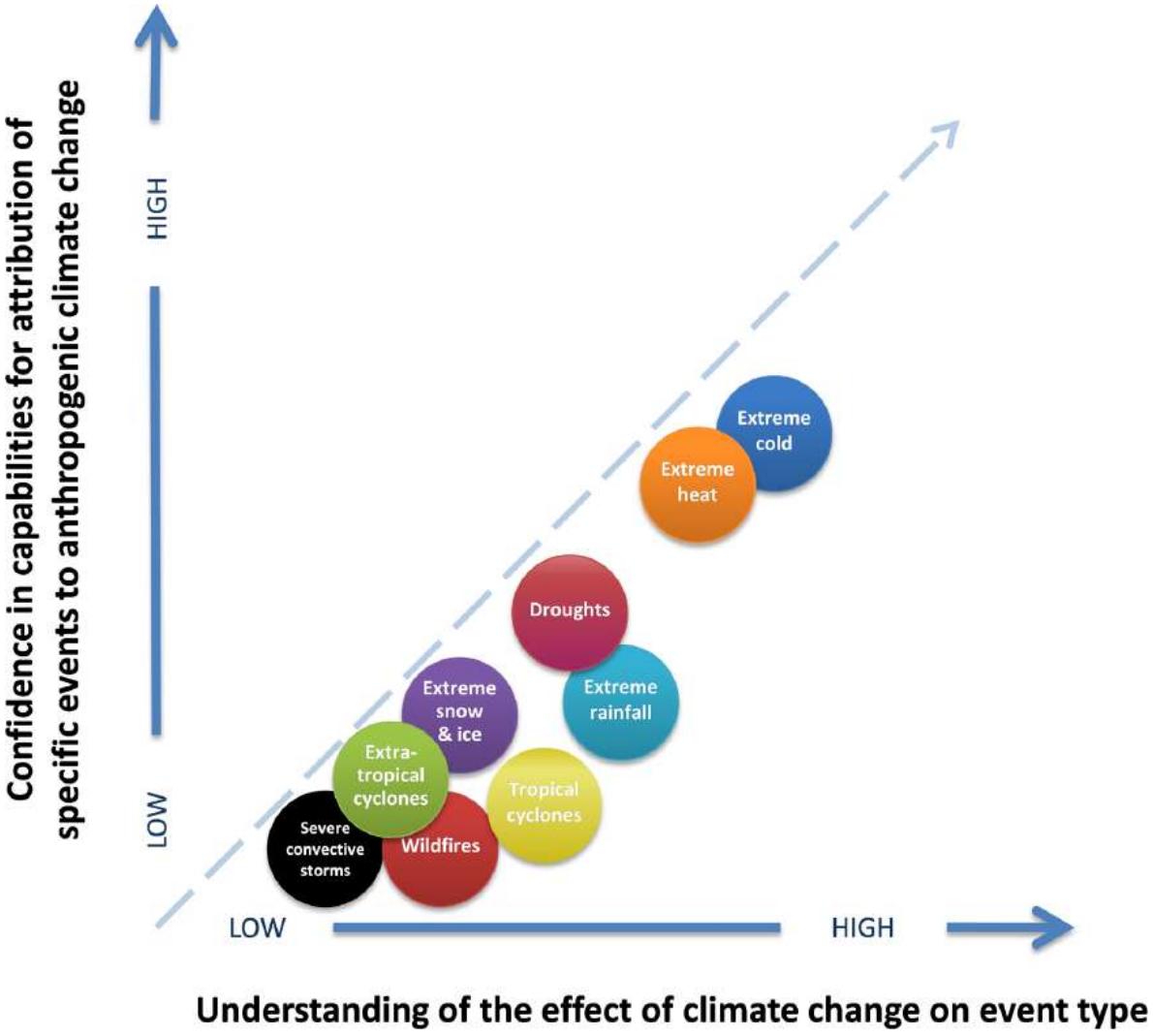

Figure S.4 from the National Academy of Science Attribution of Extreme Events in the Context of Climate Change summary chapter should be included and references for every claim made in the various Boxes of Chapter 2. (https://www.nap.edu/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change)

Box 2.5: The 2017 hurricane season ended a 12-year drought in major hurricane landfalls in the United States. The attribution of the heavy rainfall in Hurricane Harvey is not applicable to all landfalling storms nor proven to be representative of a larger sample due to its peculiar track stalling and motion at the

time of landfall. Moreover, the heaviest rainfall occurred well away from the center of circulation and involved synoptic scale dynamics not addressed in recent papers (Emanuel 2017 or Mann et al. 2017).

Unless something more compelling evidence than “consistent with” can be gleaned from the current peer-reviewed literature, Box 2.5 headline “The severity of the 2017 Atlantic season …” is particularly misleading and should be rewritten to stick to the consensus as outlined on the GFDL website, IPCC AR5, IPCC SREX, and other more authoritative assessments. The major uncertainties (Page 100) highlight the limited confidence or certainty in making such sweeping attribution or prediction claims.