SUPPLEMENT

EXPLAINING EXTREME EVENTS OF 2016 FROM A CLIMATE PERSPECTIVE

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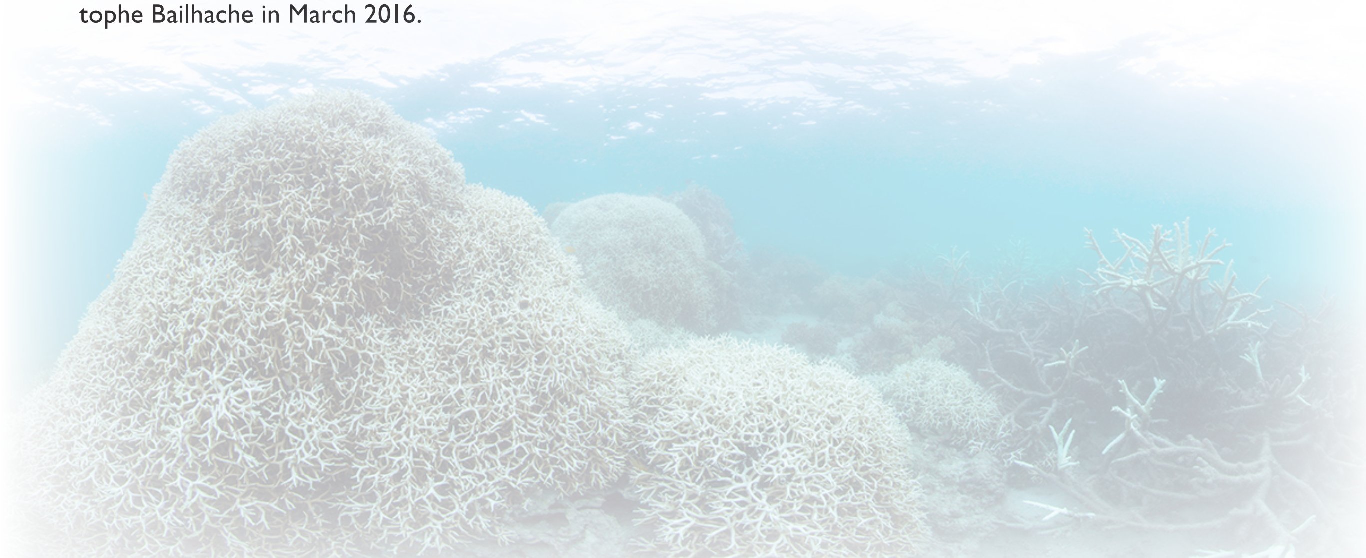

AMERICAN METEOROLOGICAL SOCIETY

ES11. WAS THE JANUARY 2016 MID-ATLANTIC SNOWSTORM "JONAS" SYMPTOMATIC OF CLIMATE CHANGE?

Klaus Wolter, Martin Hoerling, Jon K. Eischeid, and Dave Allured

This document is a supplement to "Was the January 2016 Mid-Atlantic Snowstorm "Jonas" Symptomatic of Climate Change?," by Klaus Wolter, Martin Hoerling, Jon K. Eischeid, and Dave Allured (*Bull. Amer. Meteor. Soc.*, **99** (1), S54–S59) • ©2018 American Meteorological Society • DOI:10.1175/BAMS-D-17-0130.2

Additional information on "Jonas": Two of our 19 stations (Lincoln, VA, and Central Park, NY) reported all-time record-daily snowfall, while six additional stations posted top-5 daily snow. On average, Jonas produced the second snowiest (wettest) winter day across the network since 1900/01 (median: 41.2 cm / 40.0 mm). It was quite cold with an average temperature of –7.5°C at those 13 stations. For comparison, the wettest snowstorm on record peaked on 6 February 2010 (41.7 mm), while 8 January 1996 recorded the most snow (43.2 cm).

It has been suggested (Changnon 2007) that U.S. snowstorms have become larger in scale over the period 1949–2003, thus affecting more people at the same time, even though the number of storms may be in decline. With the benefit of a much longer observational record, and focusing on the Mid-Atlantic region, it becomes apparent that this notion was anchored by the very unusual decade of the 1990s

Table ES11.1. Decadal counts of daily >15.2 cm snow totals for our Mid-Atlantic 19-station network, number of days involved and their ratio, as well as number of storms (allowing for up to three-day storms), and the ratio of >15.2 cm events to number of storms. *The last two columns single out the contribution of March storms to the season.* In each column, the biggest values are highlighted in green, lowest in red.

Decade	#6"	#days	Ratio	#storms	Ratio	#March	%of∑
1900+	46	26	1.77	21	2.19	11	23.9
1910+	35	22	1.59	19	**1.84**	08	22.9
1920+	65	26	2.50	23	2.83	16	24.6
1930+	37	18	2.06	16	2.31	16	43.2
1940+	41	23	1.78	16	2.56	17	41.5
1950+	**22**	**12**	1.83	**11**	2.00	12	**54.5**
1960+	56	27	2.07	**25**	2.24	15	26.8
1970+	32	15	2.13	13	2.46	**02**	06.3
1980+	35	16	2.19	14	2.50	05	14.3
1990+	**78**	26	**3.00**	20	**3.90**	**33**	42.3
2000+	50	**29**	**1.72**	18	2.78	**02**	**04.0**
2010+	41	22	1.86	19	2.16	07	17.1

that had larger spatial scale storms than any other time of the last century, while the 1950s had some of the smallest (Table ES11.1). A recent paper by Coleman and Schwartz (2017) has confirmed the lack of increase in spatial scale for violent snowstorms (blizzards).

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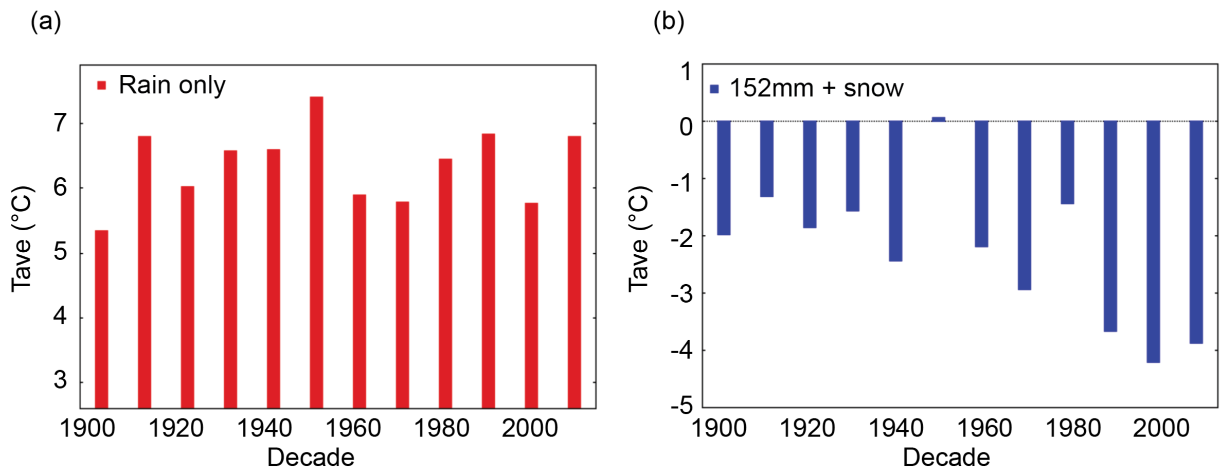

Fig. ES11.1. Average daily temperatures (°C) during heavy storms. (a) Rain-only (>25.4 mm) events (73.2% of all cases; with reference to 4668 daily observations that are non-missing for precipitation, snowfall, and average temperatures). Linear regression-based temperature increase over 116 years: +0.35°C. (b) As in (a), but only for heavy snowfall days (>15.2 cm; 11.5% of all cases). Linear regression-based temperature decrease over 116 years: −2.55°C, the only trend that is statistically significant (97%).

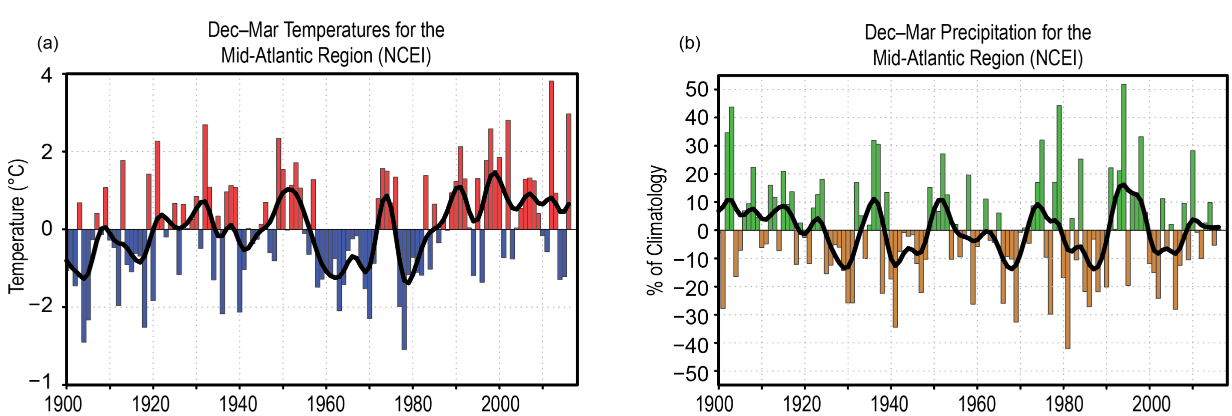

Fig. ES11.2. (a) Seasonal temperature (°C) and (b) precipitation (%) anomalies; based on 5-km gridded data used for NCEI climate divisions (Vose et al. 2014). Linear regression-based changes over 116 years: +1.1°C for seasonal temperatures, and −4% for precipitation.