STATE OF THE CLIMATE IN 2018

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STATE OF THE CLIMATE IN 2018

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Ice-rich permafrost exposed on the face of Itkillik Bluff on the North Slope of Alaska. The bluffs and surrounding ice-rich permafrost have lost large volumes of ice over recent years due to lateral erosion and surface disturbances such as wildfire and climate warming. Members of NASA's Arctic-Boreal Vulnerability Experiment visit this site annually to collect frozen soil and ground ice for carbon analysis. The team also uses regional airborne and space-borne remote sensing to identify potential volume of major ground ice loss in previously unidentified ice-rich parts of the landscape.

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c. Central America and the Caribbean—A. Sánchez-Lugo, Ed.

1) Central America—J. A. Amador, H. G. Hidalgo, E. J. Alfaro, B. Calderón, and N. Mora

For this region, nine stations from five countries were analyzed (Fig. 7.8). Stations on the Caribbean slope are: Philip Goldson International Airport, Belize; Puerto Barrios, Guatemala; Puerto Lempira, Honduras; and Puerto Limón, Costa Rica. Stations located on the Pacific slope are: Tocumen International Airport and David, Panamá; Liberia, Costa Rica; Choluteca, Honduras; and Puerto San José, Guatemala. The station distribution covers the relevant regimes of precipitation (Magaña et al. 1999) and temperature (Hidalgo et al. 2019, and references within) on the Caribbean and Pacific slopes of Central America. Precipitation and temperature records for the stations analyzed were provided either by Central American National Weather Services (CA-NWS), NOAA, or University of Costa Rica. Anomalies are reported using a 1981–2010 base period and were calculated using CA-NWS data. The methodologies used for all variables can be found in Amador et al. (2011).

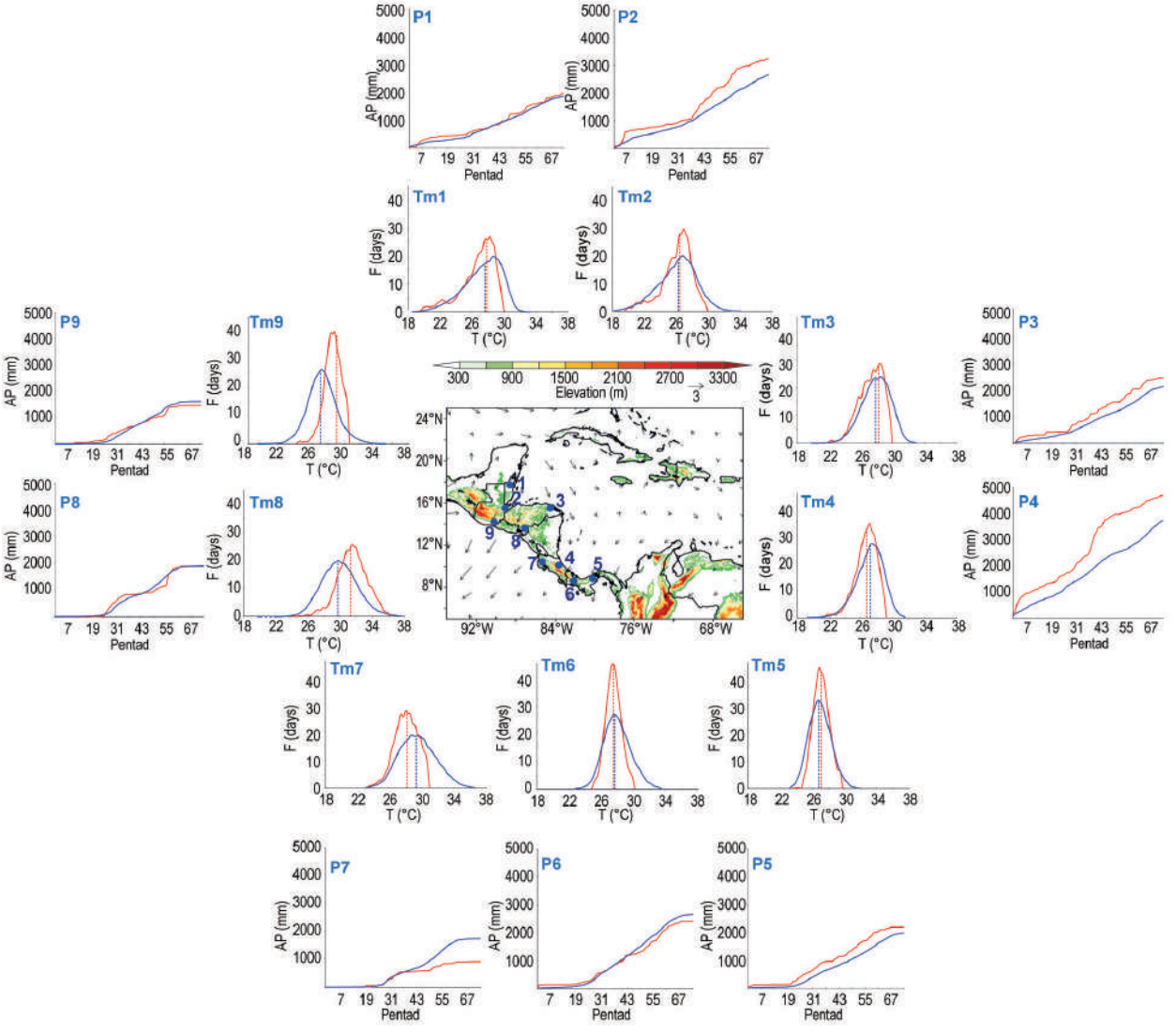

Fig. 7.8. Mean surface temperature (Tm; °C) frequency (F; days), and accumulated pentad precipitation (P; mm) time series are shown for nine stations (blue dots) in Central America: (1) Philip Goldson International Airport, Belize; (2) Puerto Barrios, Guatemala; (3) Puerto Lempira, Honduras; (4) Puerto Limón, Costa Rica; (5) Tocumen International Airport, Panamá; (6) David, Panamá; (7) Liberia, Costa Rica; (8) Choluteca, Honduras; and (9) Puerto San José, Guatemala. The blue solid line represents the 1981–2010 average values and the red solid line shows 2018 values. Vertical dashed lines show the mean temperature for 2018 (red) and the 1981–2010 period (blue). Vectors indicate Jul wind anomalies at 925 hPa (1981–2010 base period). Shading depicts regional elevation (m). (Sources: NOAA/NCEI and CA-NWS.)

(i) Temperature

The mean temperature (Tm) frequency distribution for the climatology and for 2018 for all stations is shown in Fig. 7.8. Choluteca (Tm8) and Puerto San José (Tm9) on the Pacific slope of Central America each had a discernible shift in their statistical distributions toward warmer-than-normal conditions, whereas Puerto Lempira (Tm3) showed signs of marginal warming. Philip Goldson International Airport (Tm1), Puerto Barrios (Tm2), David (Tm5), and Tocumen International Airport (Tm6) had near-normal temperatures during 2018. Slightly cooler-than-normal conditions were observed at Puerto Limón (Tm4) and Liberia (Tm7). All stations observed less frequent maximum Tm values than the mean.

(ii) Precipitation

The accumulated pentad precipitation (P; mm) time series for the nine stations in Central America are presented in Fig. 7.8. Annual accumulations were near normal at Philip Goldson International Airport (P1), Choluteca (P8), and Puerto San José (P9). Puerto Lempira (P3) and David (P5) were slightly wetter than normal, and Puerto Barrios (P2) and Puerto Limón (P4) were significantly wetter than normal. Tocumen International Airport (P6) and Liberia (P7) reported below-normal precipitation, with Liberia having the larger precipitation deficit. Low-level circulation anomalies in the westernmost Caribbean Sea region showed slightly above-average values during July (vectors in Fig. 7.8) in the trade wind system, a condition usually associated with above- (below-) normal precipitation in the Caribbean (Pacific) slopes, especially with the mid-summer drought (Amador 1998, 2008; Hidalgo et al. 2019) as observed in 2018.

(iii) Notable events and impacts

Tropical cyclone activity during 2018 was low in the Caribbean basin and in the eastern tropical Pacific (ETP). Four systems reached tropical storm category in the Caribbean basin (6°–24°N, 60°–92W): Alberto (26 May), Isaac (14–15 September), Kirk (29 September), and Michael (8 October). Michael evolved from a low-pressure system in the Caribbean that affected the region with heavy rains and accompanying human impacts in most of Central America (Online Table S7.1). In the ETP, Tropical Storm Vicente developed off Guatemala on 20 October; however, no tropical storm made landfall on the isthmus. For additional information on regional impacts from hydrometeorological events during 2018, refer to Online Table S7.1.

Several severe storms occurred across the region during April–November. During the eight-month period, a total of 28 fatalities were reported with 27 people injured by lightning strikes (Online Table S7.2).

2) Caribbean—T. S. Stephenson, M. A. Taylor, A. R. Trotman, C. J. Van Meerbeeck, J. D. Campbell, A. Brown, and J. Spence

(i) Temperature

In 2018, most of the Caribbean basin exhibited above-average annual mean surface temperatures, with the highest anomalies toward the northwest and the Guianas. Much of the northwest was at least 0.25°–0.75°C warmer than normal, with Jamaica and northern Bahamas at least 0.75°–1.5°C warmer. In contrast, parts of the southern and eastern Caribbean experienced below-average annual mean temperatures (Fig. 7.9). The annual average maximum temperature—32.3°C observed at the Sangster International Airport

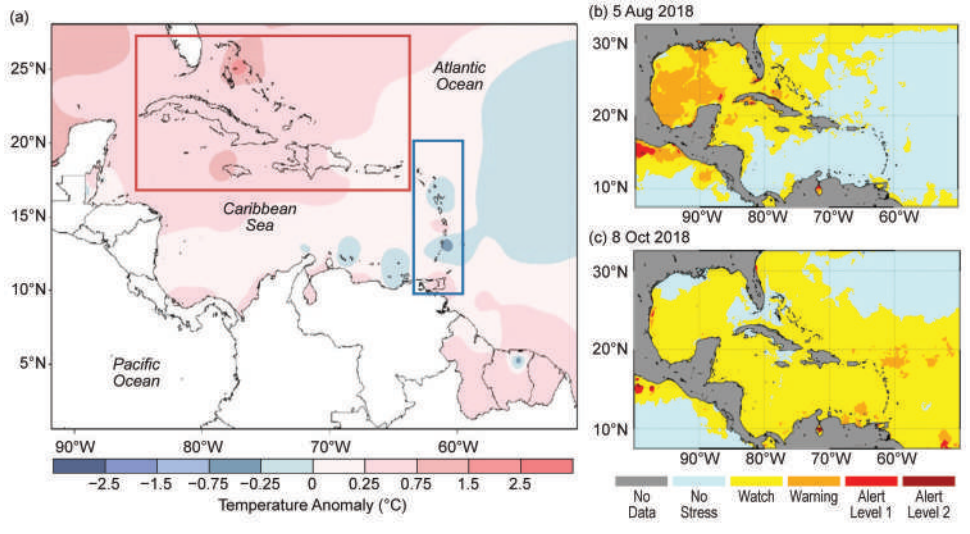

Fig. 7.9. (a) Annual mean temperature anomalies (°C) relative to a 1981–2010 base period. Coral reef watch maps for (b) Aug and (c) Oct 2018. The red rectangle indicates the north/west Caribbean. The blue rectangle indicates the south/east Caribbean. [Source: Caribbean Institute for Meteorology and Hydrology (CIMH).]

SUPPLEMENT

STATE OF THE CLIMATE IN 2018

JESSICA BLUNDEN AND DEREK S. ARNDT, EDS.

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Central America and the Caribbean (Section 7c)

Table S7.1. Summary of events and impacts, including number of fatalities (f), missing people (m), injured people (i), affected people (a), number of affected families (n), and damaged houses (d), by country and specific region. [Data sources: Central American National Weather Services, National Emergency Committees communications and regional newspapers]

Country	Specific Region	Dates (2018)	Hydrometeorological Conditions	Impacts
Panamá	Colón province	06 Jun	Rainfall, overflow of rivers and floods associated with a cold front	28a, 272n, 303d
	Colón province	19 May	Rainfall, thunderstorm and strong winds	1m, 16n
	Coclé province	08 Sep	Rainfall and overflow of rivers	1f, 1i
	Ngäbe-Buglé Shire	09 Oct	Rainfall and overflow of rivers	4f
	Corregimientos Cativá, Cristóbal and Buena Vista	15 Nov	Heavy rainfall, landslides, overflow of rivers and floods	1435a, 300d
	Curundú river and Coclé province	19 Nov	Heavy rainfall, overflow of rivers and floods	1f, 12d
Costa Rica	San José province	04 Jan	Low-temperatures associated with a cold front	2f
	Los Guido, San José province	13–14 Jun	Heavy rainfall, floods, landslides and strong winds	12a, 8d
	Upala, Alajuela province and Santa Cecilia, Guanacaste province	19–20 Jun	Rainfall and floods associated with a tropical wave	110a, 78d
	Ruta 32, Turrialba, Limón, Talamanca, Matina, Sarapiquí, Guatuso and San Carlos	14–20 Jul	Heavy rainfall, floods and landlides associated with a tropical wave	1f, 1500a, 432n
	Granadilla, Curridabat	10 Sep	Rainfall and landslides	82a
	Guanacaste and Puntarenas province	05–06 Oct	Heavy rainfall, landslides and floods associated with a low pressure system	1f, 1i, 1666a
	Sarapiquí, Heredia province and Domilicalito, Puntarenas province	11–12 Oct	Heavy rainfall, overflow of rivers and strong winds	3f, 15a
	Cartago,Guanacaste, Puntarenus and Limón provinces	17–21 Oct	Heavy rainfall, overflow of rivers and floods	7f, 557a
	Santa Clara Vieja, San Vito, Coto Brus	06 Nov	Heavy rainfall and landslides	40a, 13d
Nicaragua	Madriz and Carazo departments	26 May	Rainfall and floods associated with Tropical Storm Alberto	1f, 23d
	Managua, Granada, Rivas, Carazo, Masaya, Chinandega, León, Madriz, Matagalpa, Jinotega, Estelí, Boaco and Nueva Segovia departments	04–20 Oct	Rainfall, landslides and floods associated with the rainy season	20f, 24461a, 5436d

Country	Specific Region	Dates (2018)	Hydrometeorological Conditions	Impacts
El Salvador	La Libertad department	30 Jun	Strong winds	1i, 1d
	Guadalupe, San Vicente department	23 Apr	Rainfall, hail and strong winds	13d
	La Libertad and Santa Ana departments	26–27 Apr	Rainfall, thunderstorm	15d
	Nahuizalco, Sonsonante department	21 May	Heavy rainfall, landslides and floods	1f, 5i
	La Libertad and La Unión departments	28 May	Heavy rainfall, landslides and floods	1f, 6i, 30d
	Puente Cuscatlán and Tecoluca, San Vicente department; Villa El Rosario and Osicala, Morazán department; Berlin and San Marcos Lempa, Usulután department; Conchagua, La Unión department; Zacatecoluca, La Paz department	22 Jun–20 Jul	Severe drought	77322a
	Ahuachapán and Sonsonate departments	26 Aug	Heavy rainfall and floods	62d
	Ahuachapán and Sonsonate, La Libertad, La Paz, San Miguel, Morazán, and La Unión departments	05–19 Oct	Heavy rainfall, landslides and floods associated with a low pressure system	6f, 2m, 22i, 773a, 2175d
	San Salvador department	28 Oct	Rainfall and landslides	1f
Honduras	Colón department	04 Jan	Rainfall and overflow of rivers associated with a cold front	2f
	Omoa, Choloma, San Pedro Sula, San Manuel, Villa Nueva, Potrerios, Puerto Cortes, Azacualpa, Macuelizo, Quimistán, El Progreso, Danli, Tocoa and Utila municipalities	29 Jan–02 Feb	Rainfall and landslides associated with a cold front	5f, 1m, 4i, 64444a, 12923n, 545d
	Comayagua, El Paraíso, Francisco Morazán, Intibucá, Olancho, Lempira, Copán, Ocotepeque, Yoró, Choluteca, La Paz and Valle departments	05 Jul–25 Aug	Sever drought	170300n
	El Paraíso, San Pedro Sula	11 Sep	Rainfall, floods, thunderstorm and strong winds	180n
	Lempira, Copán, Olancho, Ocotepeque, Francisco Morazán, Comayagua, La Paz, Valle, Cortés, Choluteca, El Paraíso, Yoró, Santa Bárbara and Intibucá departments	04–21 Oct	Heavy rainfall, landslides,and floods associated with a low pressure system	10f, 5i, 33749a, 8546n, 1440d
	Atlántida, Colón and Islas de la Bahia departments	14–18 Nov	Rainfall, overflow of rivers, floods and landslides associated with a cold front	3m, 14162a, 2845n, 29d
	Tegucigalpa, Atlántida, and Colón departments	11–12 Dec	Rainfall, overflow of rivers, floods and low temperatures associated with a cold front	2f, 1i,7972a, 1454n, 9d

Country	Specific Region	Dates (2018)	Hydrometeorological Conditions	Impacts
Guatemala	Alta Verapaz, Baja Verapaz, Izabal, Quiché, Petén and Huehuetenango departments	24 Jan–20 Feb	Rainfall, overflow of rivers and floods	2m, 95 825a, 2167d
	The entire country	15–31 May	Heavy rainfall, landslides, overflow of rivers and floods	1f, 1m, 282 461a, 436d
	The entire country	01–27 Jun	Heavy rainfall, landslides, overflow of rivers and floods	4f, 284 032a, 245d
	Chiquimula, Jutiapa, Zacapa, Huehuetenango, El Progreso, Jalaá, Baja Verapaz, Quiché, Quetzaltenango, Guatemala and Santa Rosa departments	20 Jun–15 Aug	Severe drought	291 705n
	Petén and Chiquimula departments	12 Sep	Heavy rainfall, landslides and floods	184a, 32d
	Concepción Tutuapa, San Marcos	25 Sep	Heavy rainfall, landslides and floods	2f, 30a
	Baja Verapaz, Escuintla, Guatemala, Jutiapa, Petén, Quetzaltenango, Retalhuleu, San Marcos, Santa Rosa and Suchitepéquez departments	07–19 Oct	Heavy rainfall, landslides and floods associated with a low pressure system	1f, 1i, 46 097a, 3236d

Table S7.2. Summary of events and impacts, including number of fatalities (f) and injured people (i) by lightning strikes, by country and specific region. [Data sources: Central American National Weather Services, National Emergency Committees communications and regional newspapers]

Contry	Specific Region	Dates (2018)	Impacts
Panamá	Chiriquí province	27 Apr	5i
	Boquete, Chiriquí province	06 May	1f
	Ngäbe-Buglé Shire	23 Jun	2f
	Juan Hombrón, Coclé province	08 Aug	2f, 1i
	Darién province	09 Sep	1i
Costa Rica	Alajuela province	29 Apr	1i
	Cajón, Pérez Zeledón	08 May	1f, 4i
	Monteverde, Puntarenus province	15 Jun	1f
	Los Chiles, Alajuela province	08 Aug	1f, 2i
	Cerro Pelado, Guanacaste province	22 Sep	1f
	Cocal, Siquires	14 Oct	3i
Nicaragua	Río San Juan department	26 May	1f
	Ometepe Island	08 Jun	1f
	2 nautical miles, Caribbean Sea	19 Sep	1f, 2i
El Salvador	Sonsonate department	29 Aug	1f, 2i
Honduras	Intibucá department	01 May	2f, 3i
	Gracias a Dios department	15 Jul	3f, 3i
	Gracias a Dios department	25 Aug	1f
Guatemala	Retalhuleu and Escuintla departments	07–09 Apr	2f
	Alta VeraPaz department	14 May	1f
	Retalhuleu department	29 Jun	2f
Belice	Shipyard Village, Orange	16 Jun	1f
	Toledo	23 Aug	1f
	Ranchito Village, Corozal	09 Sep	1f
	Spanish Lookout, Cayo	02 Nov	1f
Total			**28f, 27i**