

NATURAL DISASTERS IN LATIN AMERICA AND THE CARIBBEAN





Latin America and the Caribbean (LAC)

is the second most disaster-prone region in the world

152 million

affected by **1,205 disasters** (2000-2019)*









- Floods are the most common disaster in the region.
- Brazil ranks among the top 15 countries in the world with the greatest population exposed to river flood risk.
- On 12 occasions since 2000, floods in the region have caused more than **US\$1 billion dollars** in total damages.
- An average of **17 hurricanes per year and 23 Category 5 hurricanes** (2000-2019).
- The 2017 hurricane season is the **third worst on record** in terms of number of disasters and countries affected as well as the magnitude of damage.
- In 2019, Hurricane Dorian became the **strongest Atlantic hurricane** on record to directly impact a landmass.
- 25 per cent of earthquakes magnitude 8.0 or higher **have occurred in South America**
- Since 2000, there have been **20 magnitude-7.0 or greater earthquakes** in the region
- The 2010 Haiti earthquake ranks among the top **10 deadliest** earthquakes in human history.
- Drought is the disaster which affects the highest number of people in the region.
- Crop yield reductions of 50-75 per cent in central and eastern Guatemala, southern Honduras, eastern El Salvador and parts of Nicaragua.
- In these countries (known as the Dry Corridor), **8 out of 10 households** in the communities most affected by drought resort to crisis coping mechanisms.



* All data on number of occurrences of natural disasters, people affected, injuries and total damages are from CRED ME-DAT, unless otherwise specified.

Cyclical Nature of Disasters

Although many hazards are cyclical in nature, the hazards most likely to trigger a major humanitarian response in the region are sudden onset hazards such as **earthquakes**, **hurricanes and flash floods**. The collective impact of recurring climate shocks, most notably protracted droughts followed by seasonal flooding, lead to complex and multidimensional humanitarian needs.



NUMBER OF PEOPLE AFFECTED BY TYPE OF DISASTER



Tropical Storms and Hurricanes

34M PEOPLE AFFECTED (2000 - 2019)

The storms impacting Central America and the Caribbean are becoming increasingly more powerful, producing increased rainfall and higher storm surge due to climate change. More frequent and intense storms in the region means there is less time for recovery between events, as witnessed in the case of Dominica.

The country was still recovering from the impact of Tropical Storm Erika in 2015, when in 2017 it was completely devastated by Hurricane Maria, which killed 64 people and affected the entire estimated population living on the island (71,293).



There are two active storm basins that OCHA monitors:

Atlantic (which includes the East Atlantic, West Atlantic, Caribbean Sea and Gulf of Mexico), which starts on 1 June and lasts until 30 November.

Eastern North Pacific which runs from 15 May to 30 November.

PERIOD 2000-2019	EASTERN NORTH PACIFIC	ATLANTIC	CROSS OVER*
Tropical Depression	48	33	-
Tropical Storm	151	148	-
Hurricanes	168	181	11
Hurricanes-Cat 5	10^	11	2

* NOAA lists them on both - usually make landfall in Central America

▲ Of the 12 category 5 hurricanes, only four made landfall in Mexico

IMPACT OF TROPICAL STORMS AND HURRICANES

Since 2000, the countries most impacted by storms in the region have been **Cuba**, **Mexico and Haiti with 110** storms, 5,000 deaths, 29 million people affected and US\$39 billion in total damages. It is important to note, however, that more 85 per cent of those deaths were recorded in Haiti, the poorest and most vulnerable country in the Caribbean, which underscores the importance of country-specific contexts for disasters in the region.





Storms should be judged not only on their strength, but also on their location and the affected government's capacity to respond. OCHA's Regional Office for Latin American and the Caribbean (ROLAC) will often pre-deploy to a country if the forecast is for an impact from a hurricane. Since 2015, ROLAC has deployed 11 times to support response efforts in the Caribbean and Central America for impacts from Hurricanes.

DORIAN (2019)

At its peak strength, Dorian, a **category 5 hurricane**, **brought winds in excess of 220mph and 23ft. storm surge** as it barrelled over north-western Bahamas. During its path of destruction, Dorian slowed to a crawl over Grand Bahama (pop. 51,000), remaining nearly stationary for some 36 hours. Abaco, the most severely affected island, suffered thousands of flattened homes, downed power lines and damaged roads and water wells. Abaco residents were left badly in need of water, electricity, sanitation and shelter. Dorian all but destroyed two Central Abaco settlements of mostly undocumented migrants. A total of 67 deaths have been reported across affected islands in the Bahamas.

EXPOSURE TO TROPICAL CYCLONES*

COUNTRY	PHYSICAL EXPOSURE TO TROPICAL CYCLONE
Bahamas	9.2
Jamaica	9.2
Cuba	8.9
Mexico	8.9
Dominican Republic	8.7
Haiti	8.7
Antigua and Barbuda	8.6
Saint Kitts and Nevis	8.4
Dominica	8.2
Belize	7.8

* The indicator is from the INFORM 2019 report based on the estimated number of people exposed to tropical storms of category greater than 1 on the Saffir-Simpson scale per year. It is the result of the combination of danger zones and the total population living in the space unit. Therefore, it indicates the expected number of people exposed in the danger zone in one year.

WEAK STORMS CAN BE EQUALLY AS DESTRUCTIVE AS THE MORE POWERFUL ONES

On 28 October 2015, Tropical Storm Erika passed well to the north of Dominica as a weak tropical storm with sustained winds of just 50mph.¹ What it lacked it intensity, however, it made up for in rainfall, as torrential downpours (maximum totals of 12.62 inches) triggered flash floods and landslides,² leaving 20 dead and affecting approximately 40 per cent of the total population. The total damages caused by Erika amounted to **US\$483 million, or 90 per cent of GDP.**³

¹ NOAA 2 NOAA 3 Common Wealth of Dominica







	FELIX	IRMA	MARIA	DORIAN**
Disaster Subtype	Hurricane	Hurricane	Hurricane	Hurricane
Date	August 31 - September 5, 2007	August 30 - September 12, 2017	September 16 - 30, 2017	August 24 - September 10, 2019
Areas Affected	El Salvador, Guatemala, Honduras, Mexico, Nicaragua	Anguilla, Antigua and Barbuda, Bahamas (The), Barbados, Cuba, Dominican Republic (The), Haiti, Puerto Rico, Saint Barthélemy, Saint Kitts and Nevis, Saint Martin (French Part), Sint Maarten (Dutch Part), Turks and Caicos Islands (The), Virgin Island (British), Virgin Island (U.S.)	Dominica, Dominican Republic (The), Guadeloupe, Haiti, Martinique, Puerto Rico, Virgin Island (British), Virgin Island (U.S.)	Lesser Antilles, Puerto Rico, The Bahamas
Wind Speed	170 mph (274 km/h)	180 mph (290 km/h)	170 mph (274 km/h)	220 mph (354 km/h)
Deaths	189	47	143	67
People Affected	245K	10M	927K	29.5K

* Hurricanes often make landfall or affect more than one country on their path. Here are four examples of category 5 Hurricanes that left destructive paths and required international assistance in more than one country at the same time.

** Data from Dorian is from OCHA and NEMA.

Between 2000 and 2019, LAC experienced **75 earthquakes** across the region, resulting in **226,000** deaths and **339,000 injured**, affecting **14 million people** and causing approximately **US\$54 billion** in total damages.

There is no accurate way of providing actionable early warning as to when an earthquake will occur. Earthquakes are measured using a magnitude scale based on a base-10 logarithmic scale, which means that for each whole number increase in magnitude, the amplitude on the ground increases tenfold. The depth of an earthquake is also an important characteristic which determines how much damage it can be expected to cause, with shallow earthquakes likely to be the most devastating.

IMPACT OF EARTHQUAKES

The LAC region in general is vulnerable to earthquakes, although Central and South America have a greater exposure compared to the Caribbean.

Central America and the west coast of the South American continent are situated within the 'Ring of Fire', a path located along the Pacific Ocean characterized by active volcanoes and frequent earthquakes.

The western coast of South America is one of the most seismogenic zones in the world, with more than a quarter of the world's 8.0-magnitude or greater earthquakes having occurred there.⁴

MONITORING

The magnitude of an earthquake, as well as the level of readiness and national capacity to respond, will largely determine the extent of OCHA's response and, if needed, surge deployment. OCHA begins to actively monitor earthquakes registering a magnitude **6.0 or higher on the Richter Scale** depending on the depth. For example, a 6.0 earthquake with a depth of <30km (shallow) would trigger contact with the International Search and Rescue Advisory Group (INSARAG) focal point.

INSARAG is a global network of more 90 countries (21 countries in the region) and organizations dedicated to urban search-and-rescue and operational field coordination, which is organized within the framework of the UN, with OCHA serving as its secretariat. INSARAG is a leading authority on best practices in organizing urban search-and-rescue operations in the aftermath of an earthquake.

4 Incorporated Research Institutions for Seismology

INSARAG

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Global Disaster Alert

onset disasters. www.gdacs.org

GDACS is an online tool that provides automatic

estimates and risk analysis following sudden-



t of South America is one of the most seism **agnitude or greater** earthquakes having occi





Recent seismological studies have identified large zones along the coast of Ecuador, Peru and northern Chile which could produce large-magnitude earthquakes in the future. There is a possibility of a magnitude-9.0 earthquake or greater occurring in this part of South America, with the Arica seismic gap in northern Chile identified as the locus of such a major earthquake.⁵

According to the LAC-INFORM Index, the countries with the greatest exposure to earthquakes in the region on a 10-point scale are:

Chile, Ecuador and Guatemala	Costa Rica	Nicaragua	El Salvador
9.8	9.6	9.4	9.3

To date, the strongest earthquake on record worldwide is the 1960 Valdivia earthquake in Chile, which registered a magnitude of **9.5 on the Richter Scale**.

EARTHQUAKES PER SUBREGION

In the past 20 years, Central and South America have been much more frequently impacted by earthquakes than the Caribbean. The number of earthquakes from the CRED database for 2000–2019 are:

South America	Central America	Caribbean*
35	32	8

*The impact on human life and total damages suffered in the Caribbean have been disproportionate to the number of earthquakes in the subregion when compared to Central and South America.

This is largely a result of the catastrophic earthquake in Haiti in 2010, which accounts for the vast majority of **deaths (222,570) and injuries (300,000)** in the region over the last 20 years from earthquakes.

Haiti alone accounts for 98 per cent of deaths, 89 per cent of injuries, 27 per cent of people affected and 15 per cent of total damage in the entire region for this period (2000-2019).

⁵ Seismic hazards along Ecuador, Peru and northern Chile (South America), available at https://link.springer.com/article/10.1007%2Fs11069-015-1900-x





STRONGEST EARTHQUAKES IN THE REGION⁶



The impact of an earthquake depends largely on context. The geographical location, the socioeconomic vulnerability of the population, and levels of preparedness and national capacity all contribute to the impact of and subsequent response to an earthquake.

⁶ NOAA Significant Earthquake Database



HAITI 7.0 MAGNITUDE (2010) VS. CHILE 8.3 MAGNITUDE (2015)

Haiti 7.0 (2010)

Sustained large-scale international assistance

Chile 8.3 (2015)

International assistance was not requested

The 2010 Haiti earthquake was a catastrophic event exacerbated by the extreme vulnerability of the population and the lack of preparedness and response capacity of national authorities.

In contrast to Haiti, Chile has rigorous building codes, conducts regular evacuation simulations and has warning systems in place to alert the population following an earthquake. Importantly, the high frequency of small and medium-sized earthquakes in Chile, which normally cause limited damage, have served to create a culture of earthquake preparedness among everyday Chileans.

TSUNAMIS

Tsunamis are **giant waves generated by earthquakes or volcanic eruptions under the sea**. While there have not been any disaster events directly caused by a tsunami in the LAC region over the past two decades, the physical exposure to tsunamis remains high as a result of the region's vulnerability to earthquakes and its many low-lying coastal areas, especially in the Caribbean where more than **70 per cent of the population reside in coastal areas** and where key infrastructure and economic activities are located.⁷

There have been tsunamis associated with many significant earthquakes in Chile, Ecuador, Peru, Guatemala, El Salvador and Nicaragua, with varying degrees of impact. For instance, while the tsunami associated with a 7.4-magnitude earthquake in Martinique in 2007 did not have much of an impact, a series of tsunami waves brought on by an 8.8-magniude quack in Chile in 2010 led to dozens of deaths in coastal areas.

Many monitoring early warning systems exist in the region and OCHA monitors them to decide when and what kind of action to take.

⁷ Caribbean Development Bank





Active volcanoes can be regularly monitored and their potential for eruption can be accurately predicted. Volcanic eruptions usually have a localized impact and may lead to temporary displacement and loss of livelihoods, which may be dealt with effectively by national authorities. In some instances, however, volcanic eruptions may require international assistance if national response capacity is overwhelmed, as was the case in **Ecuador in 2006 and Guatemala in 2010**.

Many countries in Central and South America are situated along the 'Ring of Fire', which stretches from Mexico to Chile in the region, exposing them to volcanic activity. The Caribbean is also vulnerable to volcanic activity, with active volcances in Montserrat, St. Vincent and the Grenadines, Guadalupe and Martinique. There is also a highly active submarine volcano, Kick 'em Jenny, which is located in the Grenadines island chain just 8km north of Grenada. Volcanic eruptions, though far less frequent, have the potential to cause 100 per cent property destruction and, by extension, lead to significant death tolls in the most severely affected areas.⁸

The impact of a volcanic eruption largely depends on the local context in which it occurs. While a volcanic eruption in Central and South America could led to significant destruction, temporary displacement and loss of life, a similar event in the Caribbean can cause devastating long-term consequences, potentially setting back a country's development by years.

GUATEMALA – VOLCANIC ERUPTION OF FUEGO VOLCANO (2018)

On 3 June 2018, Guatemala's 3,763-metre (12,346 feet) Fuego Volcano erupted, killing more than 200 people, injuring 27, and leaving some 260 people missing. The eruption of the Fuego Volcano was one of the most devastating in recent years, reinforcing the threat of volcanic activity in the region and its potential for significant destruction.

The volcano emitted an eight-kilometer (five-mile) stream of hot lava and a dense plume of black smoke and ash that blanketed Guatemala's capital city and other regions. The ash columns and mudflow from the Fuego Volcano affected **1.7 million people** in three departments surrounding the volcano destroying agricultural land and livelihoods. It was the largest eruption of the volcano in 44 years.⁹

OCHA's Humanitarian Advisory Team in the country worked with the United Nations System in Guatemala to support National Response mechanisms with needs assessments, information management and mapping of aid resources.

8 The University of the West Indies Seismic Department 9 OCHA

Recurring Climatic Shocks

EL NIÑO AND LA NIÑA

LAC is one of the regions most exposed to climate phenomenon and its societies and ecosystems are particularly vulnerable to the adverse affects of climate change. The region is repeatedly affected by drought, intense rains, cyclones and the El Niño/La Niña phenomenon.

El Niño and La Niña are global climate phenomenon caused by cyclical shifts in the water temperature of the Pacific Ocean. Each El Niño or La Niña event lasts approximately nine to 12 months and, on average, occurs every two to seven years. El Niño and its warm waters are usually associated with drought, while La Niña is linked to increased flooding. However, this is not always the case.

The 2015/2016 El Niño event was one of the strongest El Niño events of the past century, leading to serious disruptions in weather patterns which brought both floods and droughts during different phases. These recurrent climatic shocks, which trigger cyclical dry spells and torrential rains, have had a serious impact on food security and agricultural production, affecting livelihoods, health, water, sanitation, education and other sectors in the region.

Between June and August 2018, the Dry Corridor in Central America (El Salvador, Guatemala, Honduras and Nicaragua) experienced longer and more severe than average dry conditions - the so-called Canícula. Agricultural production witnessed a steep decline ranging from 50-75 per cent.¹⁰ As result, more than **2.2 million people** in these countries are food insecure and over **1.4 million people** are in need of food assistance.¹¹

Recurring Climatic Shocks - Droughts

Droughts are characterized by an extended period – a season, a year or several years – of unusually dry weather due to insufficient rainfall. Droughts are context-specific and escape easy definition because of the variety of methods used to define and measure their impact. They are slow onset without a clear beginning or end. **Drought disasters have affected the most amount of people in the region over the last 20 years.**

IMPACT OF DROUGHTS

Droughts may cause significant environmental, health and socio-economic problems for affected populations including: damage to or loss of crops negatively affecting agriculture-based livelihoods; depletion of food stocks and malnutrition; shortages of water for drinking and basic sanitation; and forced migration caused by acute food insecurity and a lack of economic opportunity.

While it is difficult to accurately gauge its impact, based on data available from CRED EM-DAT from 2000 onward, drought in LAC has contributed to **45 deaths, affected more than 53 million people and caused more than US\$13 billion in total damages.** There is a clear link between certain climactic patterns and drought conditions in the region. The El Niño phenomenon contributes to drought in South America, including the Andean zones of Ecuador, Peru and Bolivia as well as northeastern Brazil, and in Central America it has caused severe droughts leading to a protracted crisis in the Dry Corridor, specifically in Guatemala, El Salvador, Honduras and Nicaragua.



PEOPLE AFFECTED PER COUNTRY (2000 - 2019)



The Caribbean is also impacted by drought. In the case of Haiti, over the past two decades **more than 4.6 million people have been affected**, which is equivalent to **more than 50 per cent of the country's total population**.

MONITORING

The impact of The El Niño phenomenon in the region is an event which exceeds the capacities of a single organization or government and therefore, it requires strategic partnerships as part of a concerted effort by the international community to assist those most affected by drought.¹² In the last decade in Central America, OCHA has helped Governments and the humanitarian community mobilize funds through the Central Emergency Response Fund (CERF) to respond to the impact of drought.

WILDFIRES

Wildfires occur throughout the region, particularly where there is drought and high winds, which combine to intensify and spread fires. Most often wildfires occur far from human settlements and burn without causing major damage to critical infrastructure or communities. However, wildfires have the potential to be extremely destructive, as witnessed in Brazil when wildfires scorched vast areas of the Amazon, and in Bolivia, where fires burned more than five million hectares of land in the east.

¹² Food and Agricultural Organization of the United Nations

Recurring Climatic Shocks - Floods

Floods are considered to be one of the costliest natural disasters because of the wide array and extent of damages caused by flood events, from direct damages and losses to physical and environmental assets, including human belongings and shelter, ecological systems and production across economic sectors, to health-related issues and the loss of human life.

PEOPLE AFFECTED BY FLOODS

COUNTRY	TOTAL PEOPLE AFFECTED
Colombia	10,108,000
Brazil	7,406,000
Peru	4,484,000
Mexico	3,456,000
Dominican Republic	2,995,000
Bolivia	2,960,000
Argentina	1,440,000
Paraguay	1,198,000
Guatemala	1,035,000
Honduras	948,000

Flash floods are the most dangerous kind of flood, as their destructive power, combined with incredible speed and unpredictability, means they can happen with little or no warning, producing devastating consequences for populations caught off guard and unprepared.¹³

IMPACT OF FLOODS

Floods are the most common disaster in LAC, with 548 floods occurring since 2000. Despite the relatively low death toll directly associated with floods, they have affected almost 41 million people and caused almost US\$26 billion in total damages.

The geographical location largely determines the impact of a flood event, with areas near rivers and urban centers more at risk of flooding. Of course, the socio-economic vulnerability of the population, as well as the preparedness and response capacity of the affected government, are also very important factors for determining if international assistance will be required.

LANDSLIDES

There are many different types of landslides and they almost always have multiple causes, including rainfall, changes in water level, stream erosion, earthquakes and volcanic activity. Human activity can also be a contributing factor in causing landslides, including building roads and structures without adequate grading of slopes.

IMPACT OF LANDSLIDES

Since 2000, LAC has been impacted by 66 landslides which caused almost 3,000 deaths. In recent years, the landslide in Guatemala in 2015, which caused 350 deaths, and Colombia in 2017, which caused 349 deaths and affected more than 45,000 people, stand out as particularly destructive landslide events in the region.

Recurring Climatic Shocks - Floods



CONTEXT MATTERS

Since 2000, Brazil, **the most flood-prone country in the region**, has been impacted by 70 flood disaster events, affecting almost 70 million people.

Guyana, which experiences far fewer flood events and saw only five over the same period, **is proportionately more impacted than Brazil**, as the population's vulnerability and lack of preparedness and response capacity put large numbers at risk.





ROLAC EMERGENCY DEPLOYMENTS 2000 - 2019

OCHA



2004

- 01. Dominican Republic Floods May
- 02. Haiti Floods May
- 03. Dominican Republic Tropical Storm Jeanne September
- 04. Grenada and Cayman Islands Hurricane Ivan September 05. Haiti Tropical Storm Jeanne - September
- 06. Jamaica Hurricane Ivan September

2005

- 07. Guyana Floods January
- 08. El Salvador Floods October
- 09 Guatemala Hurricane Stan October
- 10. Nicaragua Tropical Storm Beta October

2006

- 11. Bolivia Floods February
- 12. Ecuador Floods March
- 13. Suriname Floods May
- 14. Ecuador Volcano Tungurahua August

2007

- 15. Bolivia Floods February
- 16. Uruguay Floods May
- 17. Peru Earthquake August
- 18. Jamaica Hurricane Dean August
- 19. Belize Hurricane Dean August
- 20. Honduras Hurricane Felix September
- 21. Nicaragua Hurricane Felix September
- 22. Dominican Republic Hurricane Noel October
- 23. Mexico Floods November

2008

- 24. Bolivia Floods January
- 25. Colombia Floods January
- 26. Ecuador Floods February
- 27. Cuba Hurricane Gustav August
- 28. Jamaica Hurricane Gustav August
- 29. Haiti Hurricane Hanna September 30. Turks and Caicos Hurricane Ike - September
- 31. Honduras Floods October
- 32. Panama Floods November
- 33. Guatemala Floods November

2009

- 34. Costa Rica Earthquake January
- 35. Guatemala Drought September
- 36. El Salvador Floods November
- 37. Nicaragua Hurricane Ida November
- 38. Bolivia Drought December
- 39. Honduras Drought December
- 40. Guatemala Drought December

2010

- 41. Haiti Earthquake January
- 42. Bolivia Floods February
- 43. Chile Earthquake February
- 44. Guatemala Drought March
- 45. Honduras Drought March
- 46. El Salvador Tropical Storm Agatha June 47. Guatemala Tropical Storm Agatha - June
- 48. Guatemala Pacaya Volcano June 49. Peru Cold Wave - August
- 50. Saint Lucia Hurricane Tomas November 51. Colombia Floods - December

2011

52. El Salvador Floods - October 53. Guatemala Floods - October 54. Nicaragua Floods - October

2012

- 55. Paraguay Floods April 56. Haiti Tropical Storm Isaac - August 57. Cuba Hurricane Sandy - October
- 58. Guatemala Earthquake November

2013

59. Bolivia Drought - July 60. Mexico Floods - December

2014

- 61. Bolivia Floods February
- 62. Chile Forest Fires April 63. Paraguay Floods - June
- 64. Honduras Drought September

2015

- 65. Bolivia Floods February
- 66. Chile Floods March
- 67. Guatemala Oil Spill June
- 68. Guatemala Drought August
- 69. Venezuela Migration August
- 70. Colombia Migration September
- 71. Bahamas Hurricane Joaquin October

2016

- 72. Paraguay Floods February
- 73. Honduras Zika virus March
- 74. Ecuador Earthquake April
- 75. Belize Hurricane Earl August
- 76 Haiti Hurricane Matthew October
- 77. Cuba Hurricane Matthew October
- 78. Costa Rica Hurricane Otto November



2017

- 79. Chile Forest Fires January
- 80. Panama Migration February
- 81. Peru Floods March
- 82. Barbados Hurricane Irma September
- 83. Cuba Hurricane Irma September
- 84. Dominica Hurricane Maria September
- 85. Guatemala Earthquake September
- 86. Mexico Earthquake September
- 87. Turks and Caicos Hurricane Irma September
- 88. Honduras Civil Unrest December

2018

2019

89. Bolivia Floods - March 90. Ecuador Migration - March 91. Panama Migration - March

92. Colombia Oil Spill - April

94. Guayana Migration - May

95. Brazil Migration - May

96. Peru Migration - May

98. Peru Migration - July

93. Venezuela Migration - April

97. Venezuela Migration - June

120. Cuba Tornado - February

121. Costa Rica Migration - April

122. Honduras - Drought - July

124. Bolivia Wildfires - September

123. Bahamas Hurricane Dorian - August

Region are listed here.

Natural disaster events

Migration and/or political conflict

99. Nicaragua social unrest - August

101. Trinidad and Tobago Floods - October

100. Barbados Hurricane Isaac (pre-deployment) - September

102-119. Venezuela Migration - Jan/March/April/May/June/July

Only deployments in the ROLAC

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