



EUROPEAN COMMISSION  
JOINT RESEARCH CENTRE

30 August 2019, 14:30 UTC

# HURRICANE DORIAN in the USA and Bahamas



GDACS RED ALERT

30 August 2019 - ongoing

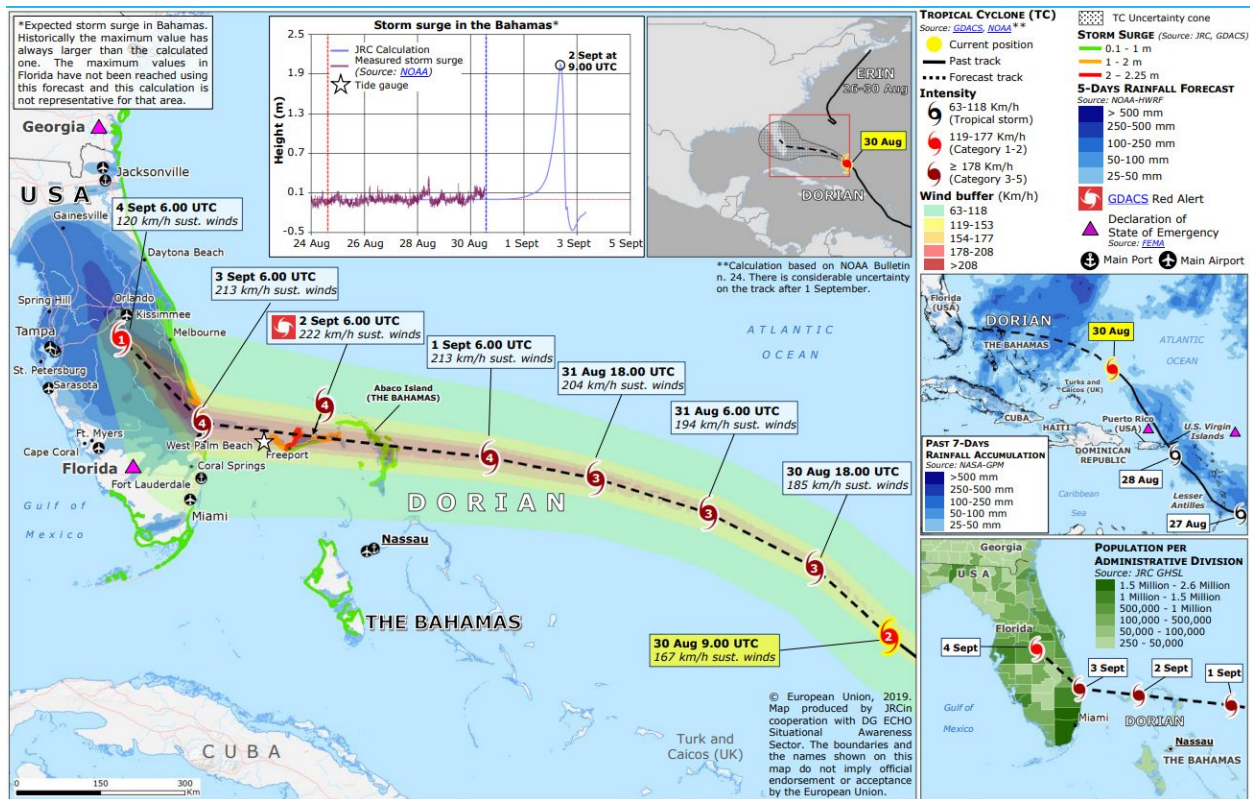


Figure 1 - TC DORIAN in the USA, Bahamas and Caribbean (as of 30 August 2019, 09:00 UTC)

## 1. Executive Summary

- Hurricane DORIAN is moving over the Atlantic Ocean towards the Bahamas and USA, strengthening. On 30 August at 09:00 UTC, its center is located approximately 800 km south-east of Nassau (Bahamas) and 1100 km south-east of West Palm Beach (Florida, USA). According to the latest forecast, it could move across the north-western **Bahamas** on **1-2 September** and

reach the south-eastern coast of **Florida** on **3 September** morning (UTC), as a Major Hurricane<sup>1</sup> (most probably as a **Category 4 Hurricane**, with max. sustained winds up to **210-220 km/h**).

- The precise landfall location in Florida is not yet known exactly as there is still a large uncertainty on the forecast track and intensity. Based on the last forecast, strong winds (**up to 220 km/h**), heavy rainfall and storm surge (**up to 2.2m**) could affect north-western Bahamas and south-eastern Florida state (USA) during its passage.
- In **Florida, Georgia, Puerto Rico and U.S. Virgin Islands a state of emergency was declared**. As of 29 August at 21 UTC, the Federal Emergency Management Agency (FEMA) continued to impress upon residents along the East Coast of Florida and Georgia to begin implementing their hurricane preparedness plans. In Florida highway tolls will be suspended for evacuation orders. The Florida Division of Emergency Management urges residents to remain alert and begin preparations<sup>2</sup>. **A Hurricane Watch is in effect for the Northwestern Bahamas**.
- The Joint Research Centre (JRC) is following the event through the information automatically collected and analysed in the Global Disasters Alerts and Coordination System (GDACS). GDACS issued a **RED** alert for **TC DORIAN** in the **USA** and **Bahamas** on **30 August**.

## 2. Situation Overview

### 2.1. Meteorological Situation

#### Tropical Cyclone DORIAN

- **PAST**: DORIAN formed over the Atlantic Ocean on 24 August and started moving west-northwest towards the Caribbean Sea, strengthening into a Tropical Storm. It reached the Barbados and St. Lucia (Lesser Antilles) on 26-27 August, the Virgin Islands and Puerto Rico on 28 August. After it started moving over the Atlantic Ocean as a Hurricane, well east off Turks and Caicos islands, strengthening.
- **CURRENT**: On 30 August at 09:00 UTC, its centre was located approx. 400 km east-northeast of the southeastern Bahamas, 800 km south-east of the north-western Bahamas, 1100 km south-east of West Palm Beach (Florida, USA), with max. sustained winds of **167 km/h** (Category 2 Hurricane).
- **FORECAST** (as of 30 August, 09:00 UTC TC data): it is forecast to move across the north-western Bahamas on 1-2 September, as a Category 4 Hurricane (max. sustained winds of 220 km/h), and reach the eastern coast of Florida on 3 September morning (UTC), still as a Major

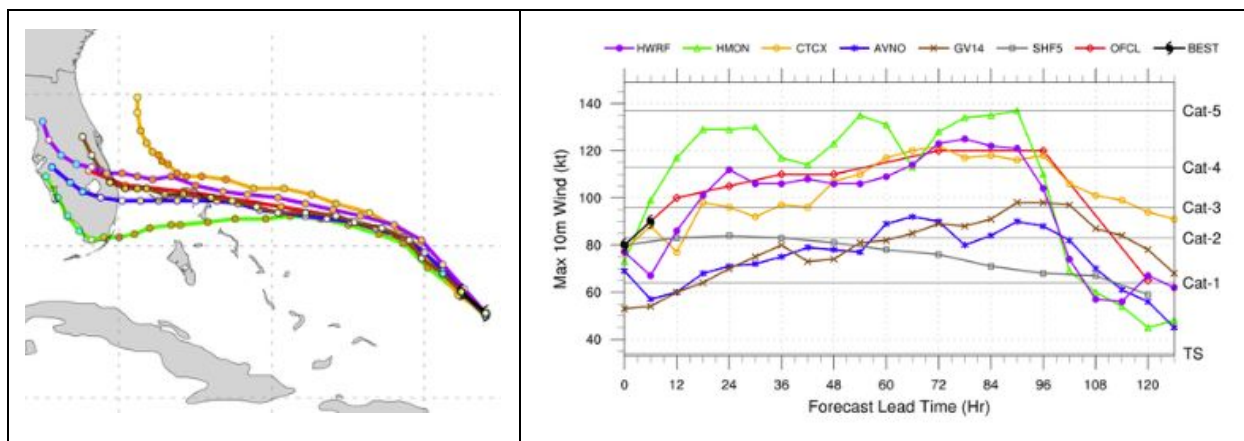
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<sup>1</sup> **Major Hurricane**: A tropical cyclone with maximum sustained winds of 178 km/h or higher, corresponding to a Category 3, 4 or 5 on the Saffir-Simpson Hurricane Wind Scale (<http://www.nhc.noaa.gov/aboutsshws.php>).

<sup>2</sup>

Hurricane (Category 4 Hurricane, with max. sustained winds up to **210-220 km/h**). There is still a large uncertainty on the forecast track/intensity.

- **UNCERTAINTY:** It is forecast to reach north-western Bahamas and eastern Florida on 1-3 September, but there is some uncertainty on the area of the landfall and a very large uncertainty on the possible Category during the landfall (between Category 1 and 4), see Figure below. According to the official forecast of NOAA-NHC, used in GDACS, it could reach north-western Bahamas and Florida as a **Category 4 Hurricane**.



**Figure 2 - TC DORIAN uncertainty track/intensity (as of 30 Aug, 00:00 UTC).**

Sources: NOAA-HWRF

Areas potentially most affected:

**Overview:** Hurricane-force winds (**Category 4**), heavy rains and **storm surge** could especially affect **north-western Bahamas**, including the city of **Freeport**, on 1 - 2 September, as well as the coastal areas of Florida (USA) on 2 - 3 September. Heavy rains and strong winds could also affect central Bahamas on 31 August - 2 September and the rest of Florida on 1-4 September and Georgia on 4-5 September.

*The possible impact (strong winds, heavy rains and storm surge) of Hurricane DORIAN in the Bahamas and USA is shown in the table below, however the uncertainty is still very large and it could still change.*

Impact Estimation: Areas potentially most affected	
<b>Wind</b>	<p><b>Max sustained winds: Category 4</b> (up to 220 km/h, with higher gusts)</p> <ul style="list-style-type: none"> <li>● <b>Bahamas:</b> <ul style="list-style-type: none"> <li>○ North-western Bahamas (Hurricane winds),</li> <li>○ Central Bahamas (Tropical Storm winds)</li> </ul> </li> <li>● <b>USA:</b> <ul style="list-style-type: none"> <li>○ Southern and central Florida (Hurricane winds) , especially southeastern coast</li> <li>○ Other areas of Florida (Tropical storm winds)</li> </ul> </li> </ul>
<b>Rain</b>	<ul style="list-style-type: none"> <li>● <b>Bahamas:</b> <ul style="list-style-type: none"> <li>○ North-western Bahamas: 150-300 mm, isolated 400 mm</li> <li>○ Central Bahamas: 25-50 mm, isolated 100 mm</li> </ul> </li> <li>● <b>USA:</b> <ul style="list-style-type: none"> <li>○ Florida: 150-300 mm, isolated 400 mm</li> </ul> </li> </ul>

	The total amount could also locally be higher than 500 mm, but the uncertainty is still high. This amount is well above the monthly average of September, that is for Freetown(Bahamas): 217 mm and for West Palm Beach ( Florida, USA): 212 mm.
<b>Storm Surge</b>	<ul style="list-style-type: none"> <li>● <b>Bahamas:</b> <ul style="list-style-type: none"> <li>○ North-western Bahamas: 2.2 m in Freeport on 2 Sep, 09:00 UTC</li> </ul> </li> <li>● <b>USA:</b> <ul style="list-style-type: none"> <li>○ South-eastern Florida (JRC calculations limited to 72h, maximum not yet reached)</li> </ul> </li> </ul>

**Table 1 – Areas potentially most affected by TC DORIAN**

Warnings in effect

<p>As of 30 Aug, 09:00 UTC, there are the following warnings/watches in effect:</p> <ul style="list-style-type: none"> <li>● A <b>Hurricane Watch</b> is in effect for the <b>Northwestern Bahamas</b></li> </ul> <p>→ including Abaco, Grand Bahama, Bimini, Berry Islands, North Eleuthera, North Andros and New Providence.</p> <p><i>A Hurricane Watch means that hurricane conditions are possible within the watch area. A watch is typically issued 48 hours before the anticipated first occurrence of tropical-storm-force winds, conditions that make outside preparations difficult or dangerous.</i></p>	<p><b>Hurricane Dorian</b> Friday August 30, 2019 5 AM AST Advisory 24 NWS National Hurricane Center</p> <p><b>Current information: x</b> Center location 23.8 N 69.1 W Maximum sustained wind 105 mph Movement NW at 12 mph</p> <p><b>Forecast positions:</b> ● Tropical Cyclone ○ Post/Potential TC Sustained winds: D &lt; 39 mph S 39-73 mph H 74-110 mph M &gt; 110 mph</p> <p><b>Potential track area:</b> Day 1-3 (solid line), Day 4-5 (dashed line) <b>Watches:</b> Hurricane (pink), Trop Stm (yellow) <b>Warnings:</b> Hurricane (red), Trop Stm (blue) <b>Current wind extent:</b> Hurricane (dark red), Trop Stm (orange)</p>
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**Figure 3 - TC DORIAN Warnings/Watches in effect (Source: NOAA-NHC and the Bahamas Department of meteorology: <http://www.bahamasweather.org.bs/>)**

**2.3 Humanitarian impact and Preparedness**

**Caribbean:** limited damage in the northern Caribbean. It left the region Wednesday night (local time).

**Bahamas:** A Hurricane Watch is in effect for the Northwestern Bahamas. Residents are asked to ensure that all hurricane preparation are put in place, as they can begin to experience the effects of the hurricane by Saturday night (local time).

**USA:**

DORIAN caused an island-wide blackout in St. Thomas and St. John in the **U.S. Virgin Islands**, and scattered power outages in St. Croix and the **Puerto Rican islands** of Vieques and Culebra. In addition, the storm downed trees and at least one electric post in St. Thomas. No reports of major flooding<sup>3</sup>.

<sup>3</sup> <https://www.apnews.com/32954856a5b4402f9a045a7935227196>

- **U.S. Virgin Islands** Emergency Declaration signed on 28 Aug. (HQ-19-094).
- **Puerto Rico** Emergency Declaration signed on 27 Aug. (HQ-19-091).

Preparedness actions are taking place in:

- **Florida:** Emergency Declaration signed on 29 Aug. (HQ-19-095) including all 67 counties. The Florida Division of Emergency Management urges residents to remain alert and begin preparations. Highway tolls will be suspended for evacuation orders.
- **Georgia:** Emergency Declaration signed on 29 Aug. (HQ-19-096) for 12 counties on the eastern coast (Brantley, Bryan, Camden, Charlton, Chatham, Effingham, Glynn, Liberty, Long, McIntosh, Pierce and Wayne).

### **3 GDACS System for TC DORIAN**

JRC is responsible for the operation of GDACS ([www.gdacs.org](http://www.gdacs.org)) that plays a major role in alerting the international community to humanitarian emergencies during natural disasters. The alerts of GDACS (Green, Orange, Red) are based on the severity of the event, the population involved and the vulnerability of the countries (see Annex). GDACS also sends e-mail and SMS alerts to subscribed recipients.

The JRC started closely following TC **DORIAN** because of the vulnerability of the Caribbean islands potentially affected, that were severely affected by Hurricanes **IRMA and MARIA** in 2017.

#### Event alert

GDACS has issued the first ORANGE Alert for this event in the Caribbean on 25 August 21:00 UTC, then reclassified as GREEN, due to a different forecasted track and intensity. It has issued a new ORANGE<sup>4</sup> alert of the USA and Bahamas on 28-29 August and this alert became **RED on 30 August**.

According to the latest bulletin (30 Sep, 09:00 UTC), the GDACS alert level is **RED** (for high winds) for this event in the **USA and Bahamas** with **2 million people** in Category 1 or higher strength winds (>120 km/h).

The automatic GDACS reports can be found at: <http://www.gdacs.org/report.aspx?name=DORIAN-19>

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<sup>4</sup> The alert for forecast greater than 3 days is limited to Orange level

 Overall Red alert Tropical Cyclone for DORIAN-19 in Bahamas, United States

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**Event summary**

Tropical Cyclone **DORIAN-19** can have a high humanitarian impact based on the maximum sustained wind speed, exposed population and vulnerability.

GDACS ID	TC 1000588
Name	DORIAN-19
From - To	24 Aug - 30 Aug
Exposed countries	Bahamas, United States
Exposed population	2 million in Category 1 or higher
Maximum wind speed	222 km/h, Category 4
Maximum storm surge	2.2 m (02 Sep 09:00 UTC)
Vulnerability	Low (The Bahamas)

**GDACS Score**



For more info on GDACS alert score click here.









	Wind	Storm surge	Rainfall	GDACS score
GDACS	222 km/h	2.2 m	n.a.	2.5

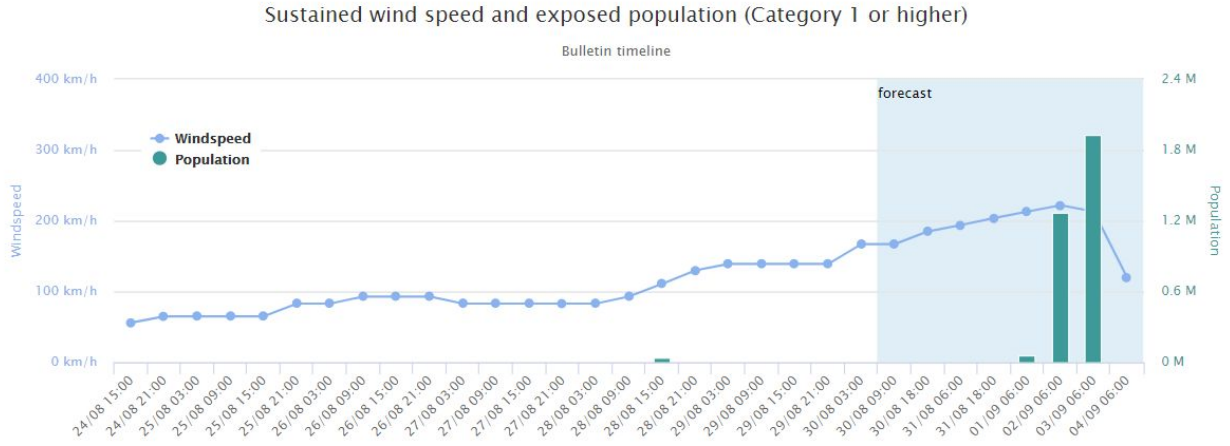
Single TC: maximum expected impact (wind, storm surge, rainfall)

Maximum expected impact (wind, storm surge and rainfall) using different data sources.

**Figure 4 - Automatic GDACS impact estimation (as of 30 Aug 2019, 09:00 UTC).**

**Bulletin Timeline**

Alert	N°	Date (UTC)	Category	Max winds (km/h)	Population in Tropical Storm	Population in Cat.1 or higher	Location (lat, lon)	Countries
	24	30 Aug 2019 09:00	Category 2	167	no people	no people	23.8, -69.1	
	24	30 Aug 2019 18:00	Category 3	185	no people	no people	24.8, -70.3	
	24	31 Aug 2019 06:00	Category 3	194	no people	no people	25.6, -72	
	24	31 Aug 2019 18:00	Category 3	204	16000 people	no people	26.1, -73.8	Bahamas
	24	01 Sep 2019 06:00	Category 4	213	75000 people	57000 people	26.4, -75.5	Bahamas
	24	02 Sep 2019 06:00	Category 4	222	7.1 million people	1.2 million people	26.7, -78.3	United States
	24	03 Sep 2019 06:00	Category 4	213	10.8 million people	1.9 million people	26.9, -80.1	United States
	24	04 Sep 2019 06:00	Category 1	120	no people	no people	28.1, -81.4	United States

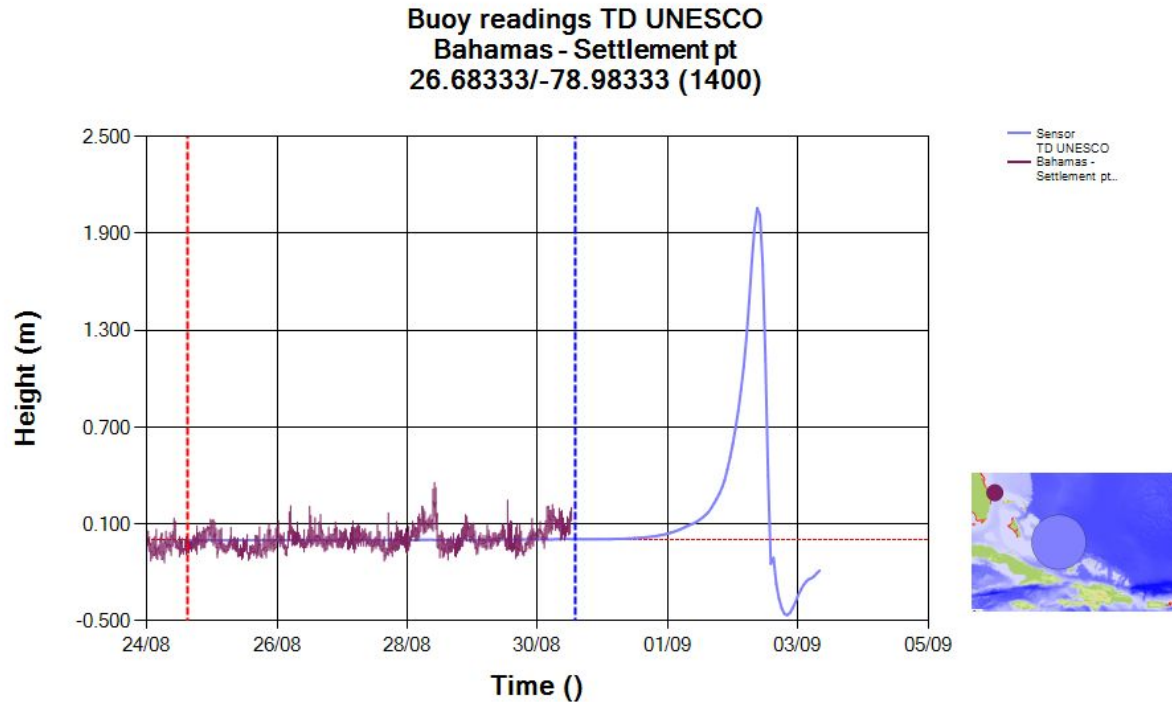


**Figure 5 - GDACS Alert for Tropical Cyclone DORIAN - Event Timeline, population exposed, max. sustained winds (Category: Saffir-Simpson Hurricane Scale), as of 30 Aug 2019, 09:00 UTC.**

### Storm Surge Calculations

According to the JRC HyFlux2 storm surge calculation (using as input the data of the bulletin of 30 Aug 2019 09:00 UTC) and using the standard GDACS model, the areas potentially most affected are in north-western Bahamas (see list below) and south-eastern Florida (USA) with a maximum value

- **2.2 m** in Freeport (Bahamas) on 2 Sep at 09:00 UTC

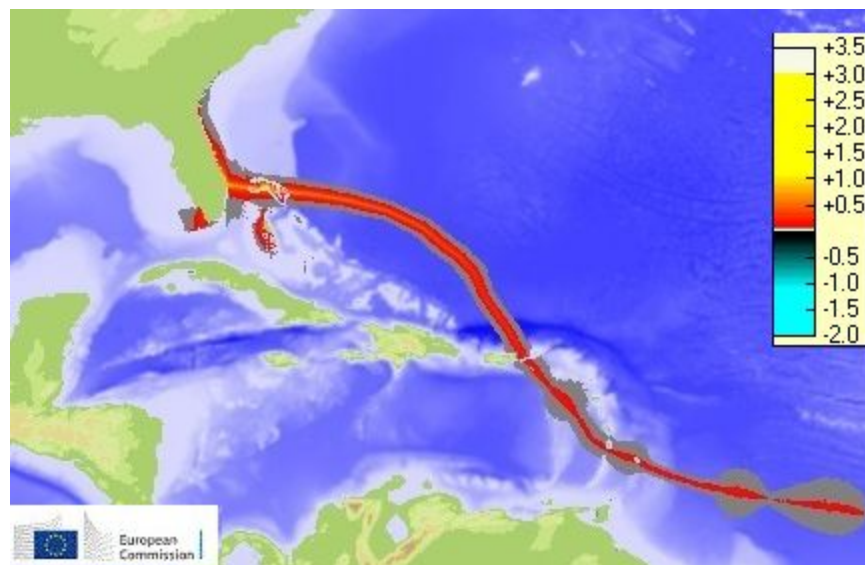


**Figure 6** - Storm surge at the Settlement point in Bahamas. The point does not represent the location where the maximum storm surge is expected.






**NOTE:** These values could still change due to the track/intensity uncertainty and do not include the possible effects in the USA because storm surge is calculated only for 3 days forecast. Therefore the maximum values in Florida (USA) have not been reached using this forecast and this calculation is not representative for that area. The maximum could still increase using the new forecasts.

It should be noted that this is a period of high maximum tide but the exact time of maximum could still change and coincide with a low tide period. Given the uncertainties this point is still not clear.





**Figure 7 - Storm surge over the track of Tropical Cyclone DORIAN**

Alert	Date (UTC)	Name	Country	Storm surge height (m)
	02 Sep 2019 09:00	Freeport	The Bahamas	2.2
	02 Sep 2019 09:00	Hunters	The Bahamas	2.2
	02 Sep 2019 09:00	Southwest Point	The Bahamas	1.8
	02 Sep 2019 10:00	Holmes Rock	The Bahamas	1.5
	02 Sep 2019 04:00	Crown Haven	The Bahamas	1.4

**Figure 8 - Storm Surge affected locations of DORIAN in the Bahamas (> 1.3m). USA is not included in the table, because the calculations are limited to 72h.**

Note: JRC storm surge calculations don't include wave, tide and river effects. It is important to note that in the area of a delta river, the storm surge may be higher. The torrential rains that may affect the mountains areas during the passage of a Tropical Cyclone may increase the river flow and its outflow could be blocked by the incoming storm surge. This could create floods in the surrounding areas of the cities close to a delta river.

## 4 Other information

### 4.1 Copernicus EMS, Emergency Mapping Service

Not yet activated. In the next hour possible pre-tasking may be executed on the basis of the latest wind and storm surge forecast

## 4.2 Virtual OSOCC Activation

A breaking discussion has been activated on the 26 August on GDACS. Information sharing is ongoing among the humanitarian community. No request for assistance has been asked by the affected/exposed Countries.

## 4.2 International Charter for Space and Major Disasters

None.

## 5 Expected Updates

The report will be updated if relevant changes will be identified.

## 6 References and contact points

Contact points within JRC:

- Alessandro Annunziato, [alessandro.annunziato@ec.europa.eu](mailto:alessandro.annunziato@ec.europa.eu)
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- Tom De Groeve, [tom.de-groeve@ec.europa.eu](mailto:tom.de-groeve@ec.europa.eu)

For updated information on the disaster, please consult the following web sites:

- GDACS: <http://www.gdacs.org>
- ERCC portal: <http://erccportal.jrc.ec.europa.eu/>
- National Meteorological service:
  - USA: <https://www.weather.gov/>
  - Bahamas: <http://www.bahamasweather.org.bs/>
- Regional Specialized Meteorological Centres (RSMCs):
  - RSMC Miami-Hurricane Center/NOAA/NWS National Hurricane Center, USA  
<http://www.nhc.noaa.gov/index.shtml>
- NOAA-HWRF (Hurricane Weather Research and Forecasting system):  
[http://www.emc.ncep.noaa.gov/gc\\_wmb/vxt/HWRF/index.php](http://www.emc.ncep.noaa.gov/gc_wmb/vxt/HWRF/index.php)

## Annex 1 - Detailed Map on the Tropical Cyclone

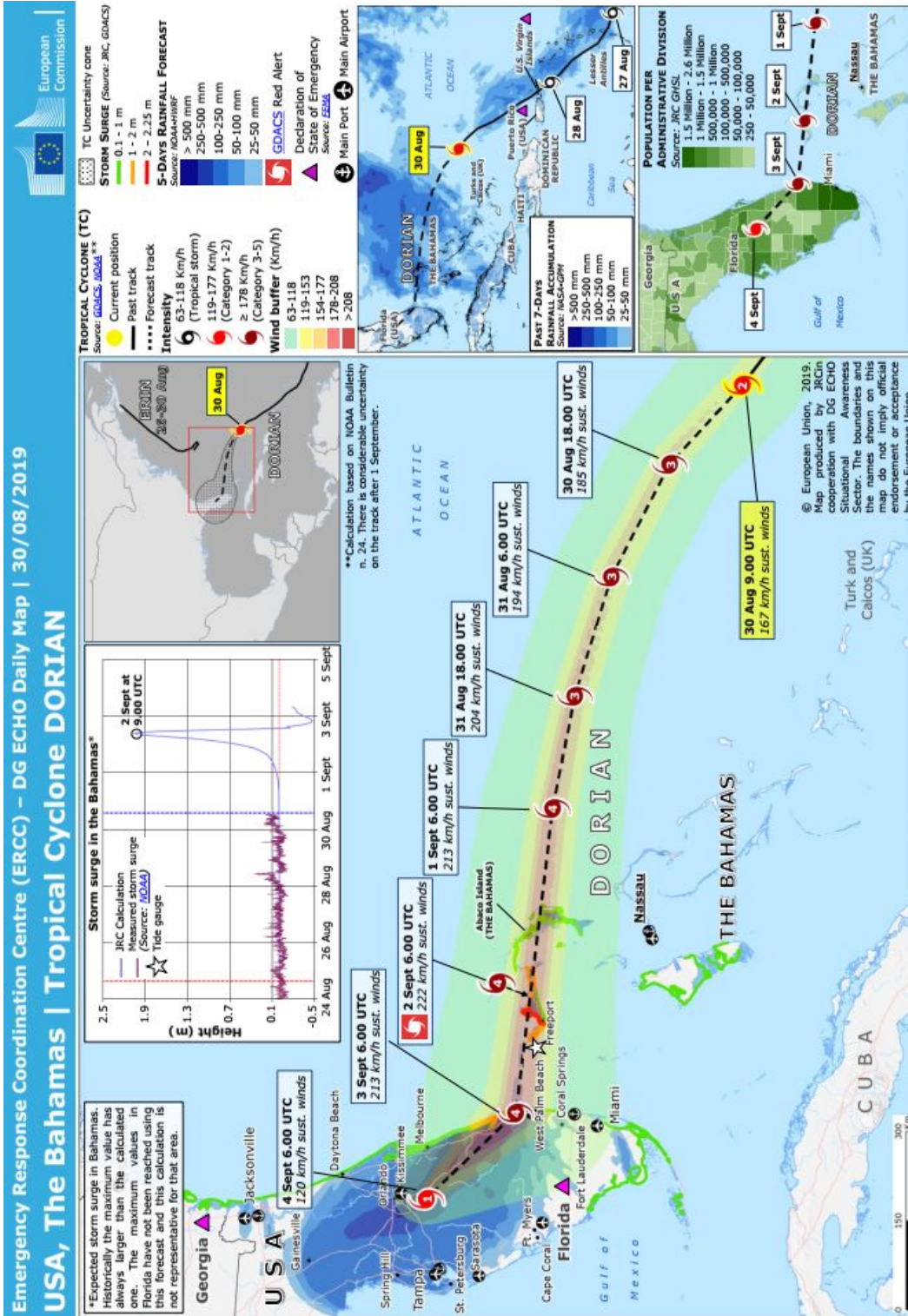


Figure A - ECHO Daily map of 30 August 2019