Trinidad & Tobago Meteorological Service

CURRENT STATUS: 18 SEP 2017:

Reef Referee

TTMS Coral Reef Watch:

September 18th 2017 Issue 4 Volume 1

BLEACHING ALERT LEVEL 1

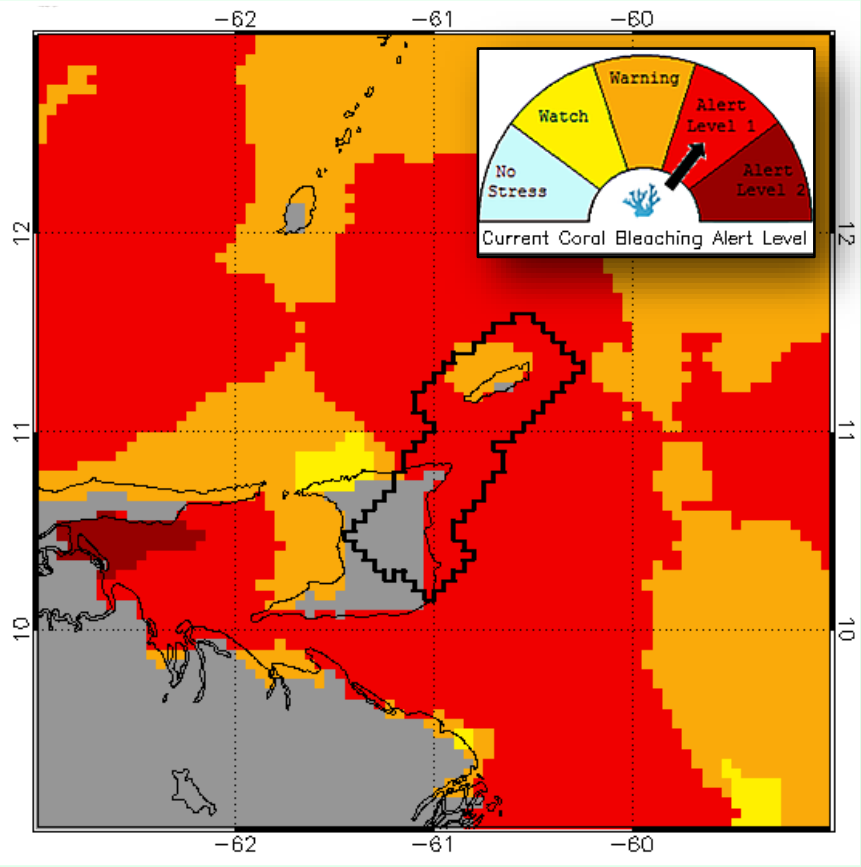


FIG 1: NOAA-CRW BLEACHING ALERT STATUS 16 SEP 2017)

TRINIDAD & TOBAGO BLEACHING STATUS:

Trinidad and Tobago is in the peak of its Coral Bleaching Season and currently under **BLEACHING ALERT LEVEL 1** (red status in Fig.1a & b). The Sea Surface Temperature trend is variable with areas of heating (up to +2.0) and areas of cooling up to –2.0ºC).

INDEX SUMMARY

- **SST is above the September Mean SST Climatology**
- **SST is above the Bleaching Threshold of 29.8°**
- **SST: 30.0 °C**
- **SSTA: 1.6**
- **HS: 1.4**
- **DHW: 2.9**

TRINIDAD & TOBAGO BLEACHING OUTLOOK:

Heat stress is expected to continue accumulating through September, increasing the Alert Status to **BLEACHING ALERT LEVEL 2,** the highest alert level. **(**Figs. 2a, 2b & 2c). Temperatures are expected to remain high over the next few months (October—November) so that this high alert level persists.

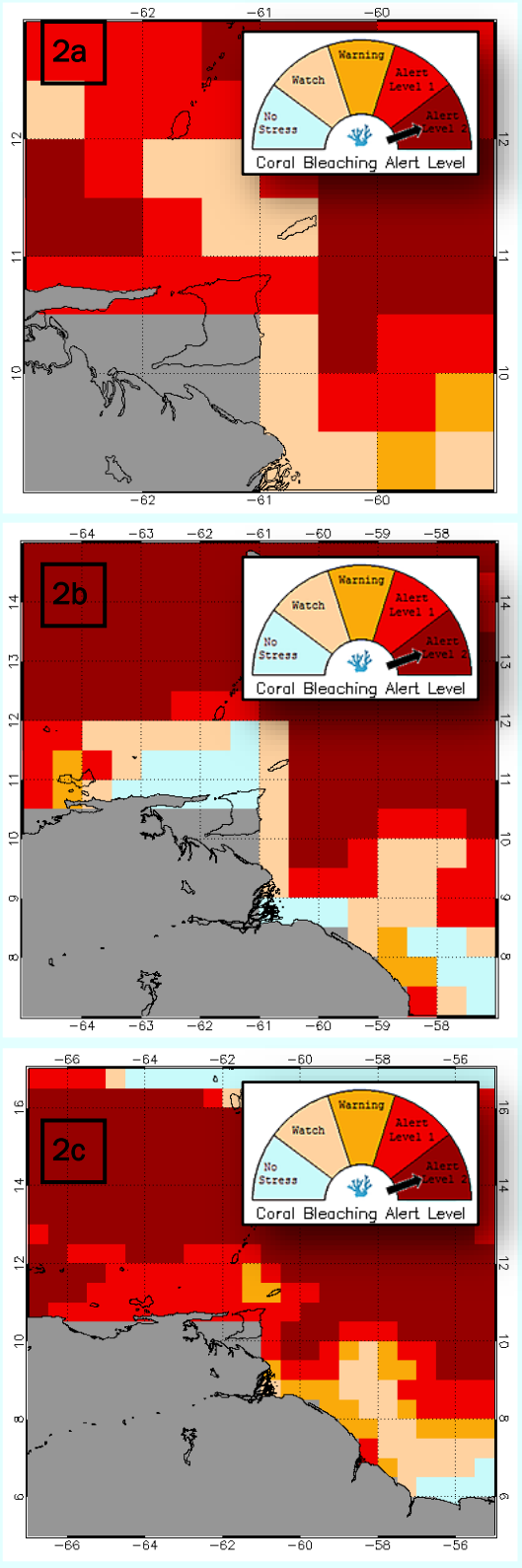


FIG. 2: NOAA-CRW 16 SEP 2017 60% OUTLOOK 2a) 1-4 WEEKS; 2b) 5-8 WEEKS & 2C) 9-12 WEEKS

Recap: Last issue

- Reefs are highly sensitive
- Reefs require specific conditions with respect to salinity, temperature, depth, turbidity and nutrients:
- Trinidad and Tobago's coastal waters are influenced by the Venezuelan Orinoco River.
- The large amounts of sediment and freshwater put into the marine environment by the Orinoco River is the primary limiting factor to coral growth and distribution in T&T.
- Trinidad has only two regions of reef development: the northwest peninsula (Chagaramas) & the northeast peninsula (Toco).
- Tobago, on the other hand, has reef development all around the island
- The two major reefs in Trinidad & Tobago are both located off the island of Tobago
- The two major reefs are:

1. **Buccoo Reef** in southwest Tobago &
2. **Angel's Reef** in northeast Tobago

Coral Reefs & Hurricanes:

Ocean waters are stratified (layered) by temperature and salinity (Figure 3) so that warmer, less salty water overlays the colder, saltier water. The uppermost layer has the highest temperatures and it is called a mixed layer, because it is continuously being mixed and kept in contact with the atmosphere from which it absorbs heat. Below this is the thermocline (Figure 3) layer, which gets colder as depth increases.

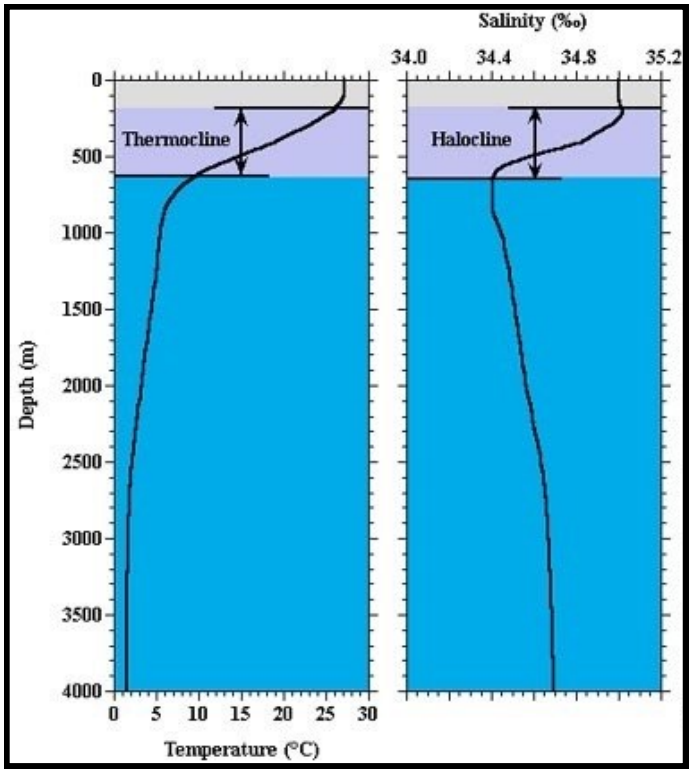


Fig 3: Vertical Ocean Profile of Temperature and Salinity (courtesy quora.com)

Although marine organisms are generally well adapted to natural environmental variations, we know that two of the major influencing parameters on coral reef growth and distribution are temperature and salinity.

Let us then take a look at how hurricanes affect ocean temperatures and salinity.

When a hurricane passes over the ocean it forces mixing by pushing warm water downward and bringing colder water upwards, resulting in a more homogeneous temperatures and salinity in the ocean upper levels. This means that the surface water is cooler and saltier, and deeper water is warmer and has a lower salinity. Stronger and slower moving hurricanes will promote upwelling of cold water much more effectively than a weak storm or a fast-moving storm. This cooling of the ocean water can effect a weakening of the storm. The storm creates a trail of cooled water along its path called a "cold wake", which is clearly visible on sea surface temperature maps. Figure 4 shows the path of Hurricane Irma (August 30-September 2017) and Figure 5 shows the cold wake from the passage of Hurricane Irma clearly defined along the northern perimeter of the Caribbean islands.

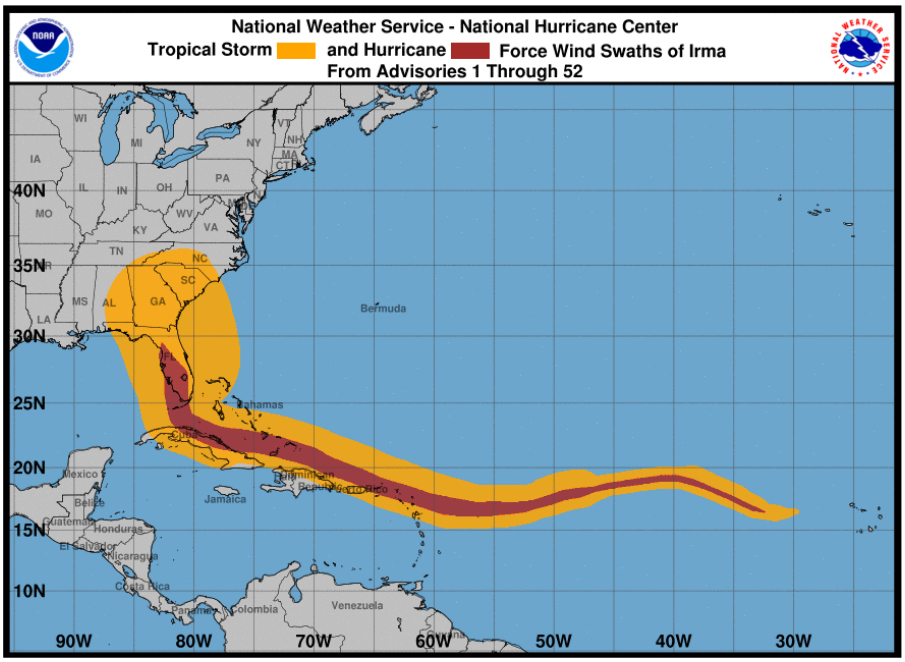
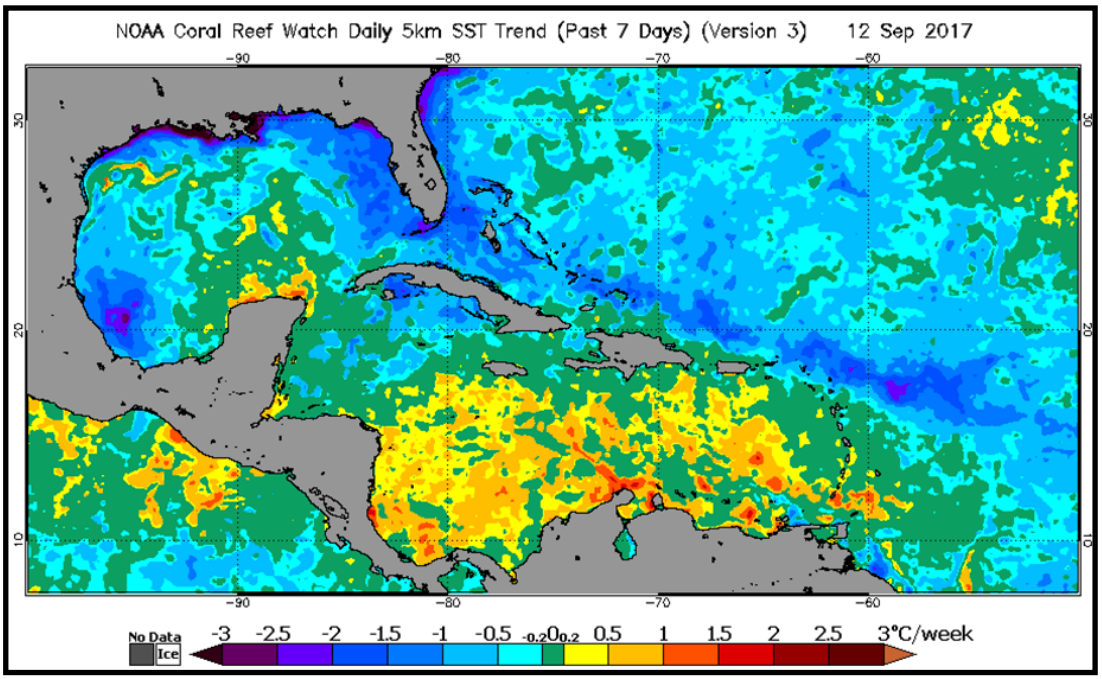


Fig. 4: NOAA-NHC Hurricane Irma Path (Sept 2017)

Below the ocean surface, strong currents and turbulence generated associated with storm activity have been known to persist for days after a storm passes. In very shallow coastal areas, the large quantities of cold fresh water introduced to the marine system via precipitation can reduce the sea surface temperature and salinity. Some studies conducted in the Caribbean Sea have shown that in the year following a hurricane, coral cover can be reduced by 15-20% depending on hurricane intensity.



Several factors negatively impact coral reefs: 1) turbulent water physically damages the coral structure; 2) the increase in turbidity decreases the sunlight available to the algae within the coral polyp; 3) the particles in suspension clog the coral pores; 4) the large amounts of rain water decreases salinity in shallow areas; and 5) the amount of dissolved oxygen in the water decreases the amount of oxygen available for respiration.

FIG. 5: NOAA-CRW SEPT 12TH 2017 CARIBBEAN-ATLANTIC SEA SURFACE TEMPERATURE SHOWING COLD WAKE OF HURRICANE IRMA

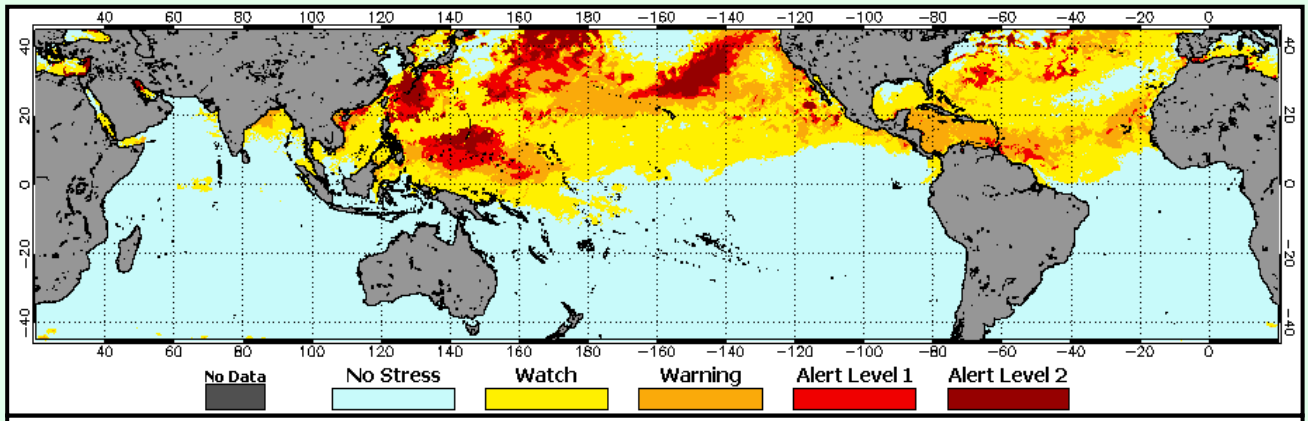


FIGURE 6: NOAA-CRW GLOBAL CORAL BLEACHING ALERT STATUS: 13 SEP 2017

GLOBAL STATUS: As seen in Figure 6, we are in the Northern hemisphere's Coral Bleaching Season and heat stress exists primarily north of the equator. There are several areas of **ALERT LEVEL (1 OR 2)** evident in the Pacific Ocean: 1. the Philippine Sea east of the Philippines 2. the East China Sea (south of Japan) 3. Eastern Pacific Ocean. By comparison, the Atlantic is under less heat stress with smaller regions of Alert Level 1 Stress.

The 90% **GLOBAL OUTLOOK** predicts a global decrease in heat stress over the next 3 months. Conditions are expected to reach **BLEACHING ALERT LEVEL** Status in the Caribbean Sea and the Northeast Pacific Ocean and in the region of Micronesia, as seen in Figure 7 below.

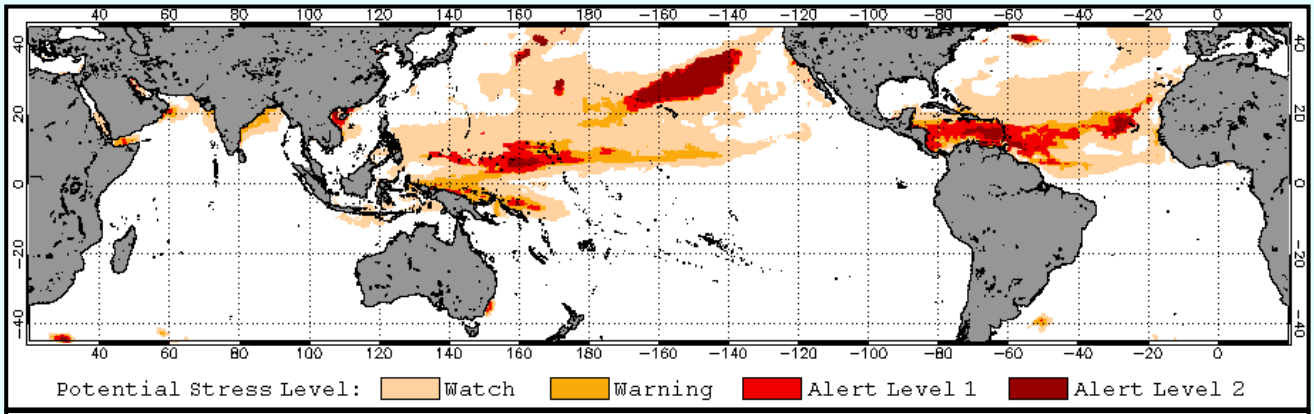


FIGURE 7: NOAA-CRW GLOBAL CORAL BLEACHING 90% OUTLOOK SEPTEMBER - DECEMBER (ISSUED: 12 SEP 2017)

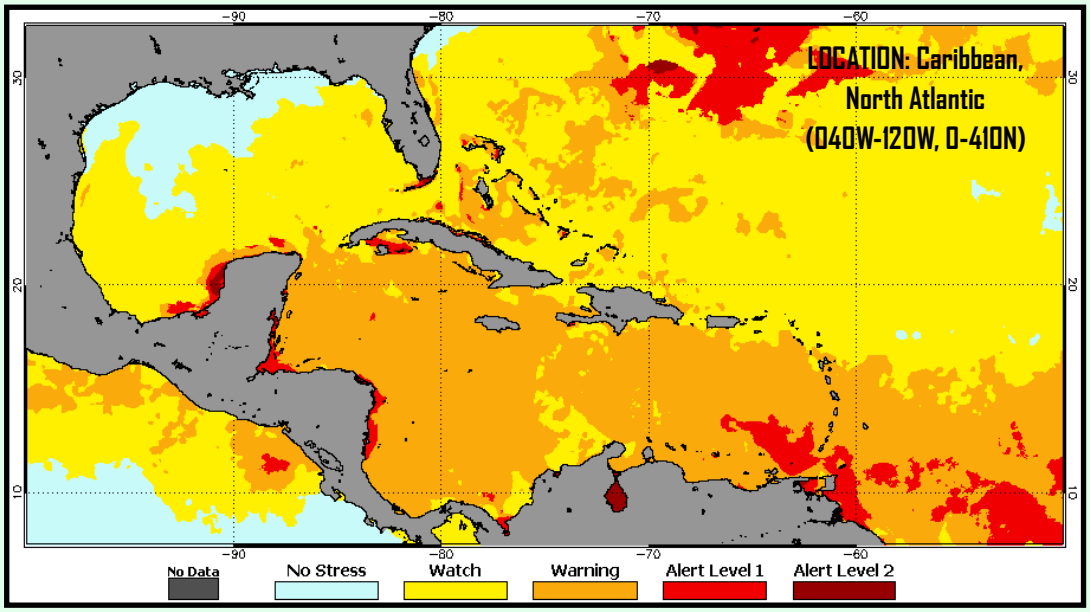


FIGURE 8: NOAA-CRW CARIBBEAN CORAL BLEACHING ALERT STATUS: 13 SEP 2017

REGIONAL STATUS:

All of the Caribbean Basin is under **CORAL BLEACHING WARNING** and, as already discussed, Trinidad and Tobago is under **BLEAHCING ALERT LEVEL 1 STATUS** (as seen in Figure 8).

BLEACHING ALERT 1/2 also exists along the Yucatan Peninsula and at the Columbia-Panama border; in Lake Maracaibo and near western Cuba. Noticeable is the clearly defined region of lower heat stress north of the island chain along the path of Hurricane Irma.

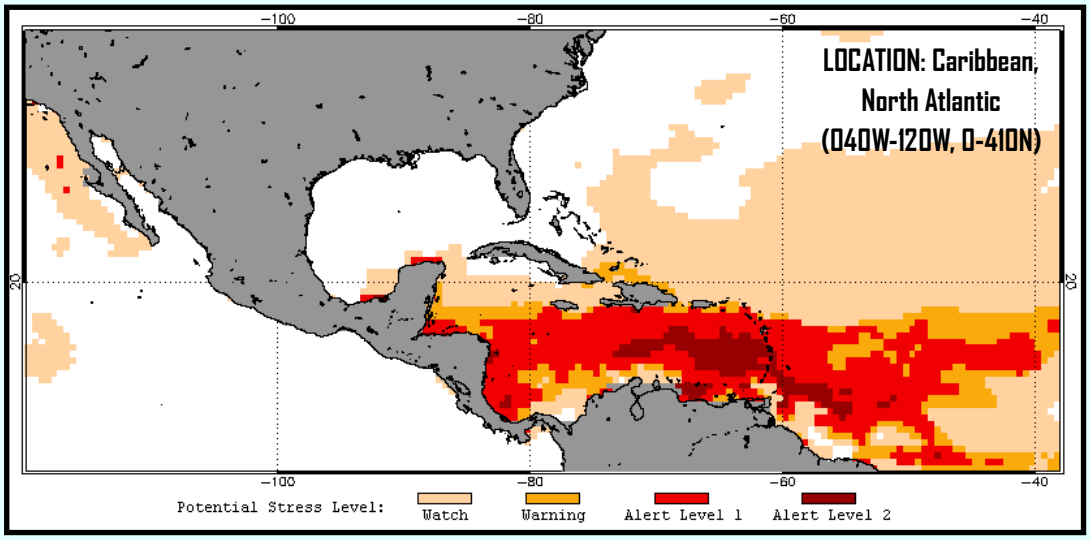


FIGURE 9: NOAA-CRW CARIBBEAN BLEACHING ALERT AREA SEP-NOV 2017 90% OUTLOOK 13 AUG 2017

REGIONAL OUTLOOK:

Heat stress is expected to continue accumulating, raising the Caribbean Region's threat level to **ALERT LEVEL 1/2.**

The Outlook (Figure 9) shows a region of lowered heat stress coinciding with the "Cool wake" of Hurricane Irma, similar to that displayed in the Current Bleaching Alert Map (Fig. 8).

ACKNOWLEDGEMENTS: THE TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE (TTMS) WOULD LIKE TO THANK THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) & THE CARIBBEAN INSTITUTE FOR METEOROLOGY AND HYDROLOGY (CIMH) FOR THEIR CONTINUED SUPPORT AND GUIDANCE TOWARDS THE ADVANCEMENT OF ATMOSPHERIC AND HYDROLOGICAL SCIENCES.

Next Issue: 2017-OCT
T&T Bleaching
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Recap:
Buccoo Reef
Angel's Reef
Reef Heat Resistance
Global
Regional

RESOURCES:

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9. http://oceanexplorer.noaa.gov/facts/hurricanes.html

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