EUROPEAN COMMISSION
JOINT RESEARCH CENTRE

13 February 2018 14:30 UTC

Tropical Cyclone GITA – Tonga, Fiji

GDACS Tropical Cyclone Red Alert

Update #1 - 09 Feb 2018 - ongoing

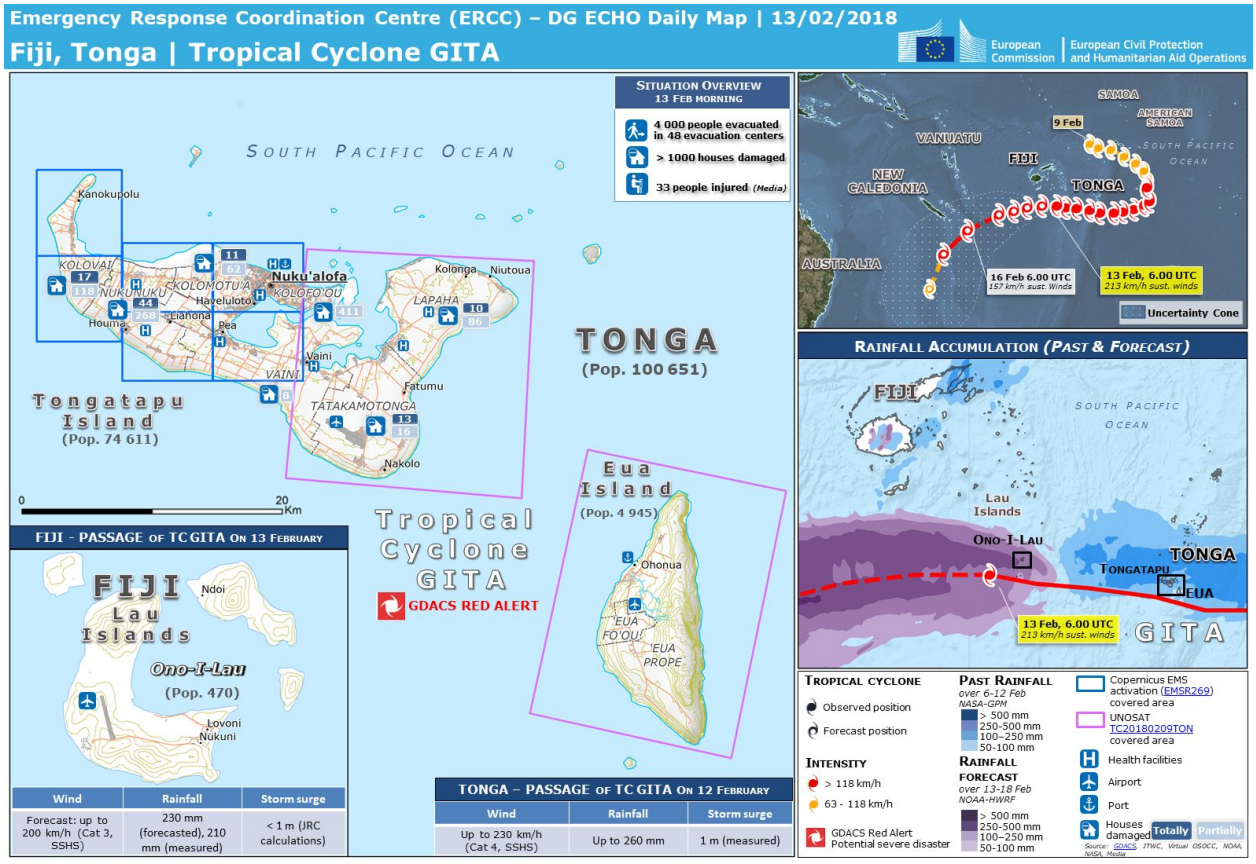


***Figure 1** - TC GITA in Tonga (as of 13 Feb, 12.00 UTC)*

1 Executive Summary

- The eye of the Tropical Cyclone GITA passed south of the islands of **Eua** and **Tongatapu** (Tonga) on 12 February morning (UTC) as an intense Tropical Cyclone with max. sustained winds of **230 km/h**. Very strong winds, heavy rains and storm surge (**1 m**

in **Nuku'alofa**) affected the islands of **Eua** (pop. 4 900), **Tongatapu** (74 600), including the capital Nuku'alofa. On 13 February morning (UTC) it passed south of **Ono-I-Lau** (450 people, Lau islands, Fiji) , still with max. sustained winds of **210-220 km/h**.

- Over the next 24 h, GITA is forecast to continue moving west passing approx 200 km south of **Kandavu** island (Fiji) on 13 February (evening) and it will start turning south-west on 14 February, moving away from Fiji and Tonga.
- **Tonga** (Tongatapu and Eua): 1 fatality, 3 serious and 30 minor injuries, 3 939 people evacuated inside 48 evacuation centers, several buildings damaged, including the parliament building, flooded roads and the airport is currently closed.
- The Copernicus Emergency Management Service was activated (**EMSR269**) on 12 February for the west part of Tonga, in coordination with other international initiatives (i.e. UNOSAT, Charter of Major Disasters).
- 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), providing situation maps and compiling this report. GDACS issued a RED alert for TC GITA in Tonga on 11 February, 24h in advance to the landfall.
- The Emergency Response Coordination Centre (ERCC) is closely monitoring the situation, in coordination with a DG ECHO field expert who is being deployed to the region.

The first JRC Emergency Report related to this event was prepared on 12 February; the current report is an update of the situation and includes only the new information.

2 Situation Overview

2.1 Meteorological Situation

Tropical Cyclone evolution

- Tropical Cyclone **GITA** passed very close (approx. 20-30 km) to the islands of **Eua** (pop 4 900 people) and **Tongatapu** (pop. 74 600, most populous island of Tonga) on 12 February morning (UTC), as an intense Tropical Cyclone with max. sustained winds of 230 km/h (equivalent to a **Category 4** in the SSHS, see Annex). On 13 February morning (UTC), its center passed approx. 50 km south Ono-I-Lau island (**Lau islands, Fiji**) with max. sustained winds of **210-220 km/h** (equivalent to a **Category 4** in the SSHS).
- **Very strong winds**, heavy rains (200 mm/24 h in Ono-I-Lau) and storm surge (1 m in **Nuku'alofa**) affected the islands of **Tongatapu**, including the capital **Nuku'alofa**, and **Eua**, as well as the southern **Lau islands (Fiji**), including Ono-I-Lau island.
- Over the next 24 h, GITA is forecast to continue moving west passing approx 200 km south of Kandavu island (Fiji) on 13 February evening (UTC) and it will start turning

south-west on 14 February, moving away from Fiji and Tonga. Afterwords, It is forecast to continue moving south-west over the Pacific Ocean, weakening. Its center it is expected to pass approx 300-400 km south-southeast of Vanuatu on 15 February and approx. 200-300 km south-east of New Caledonia on 16 February.

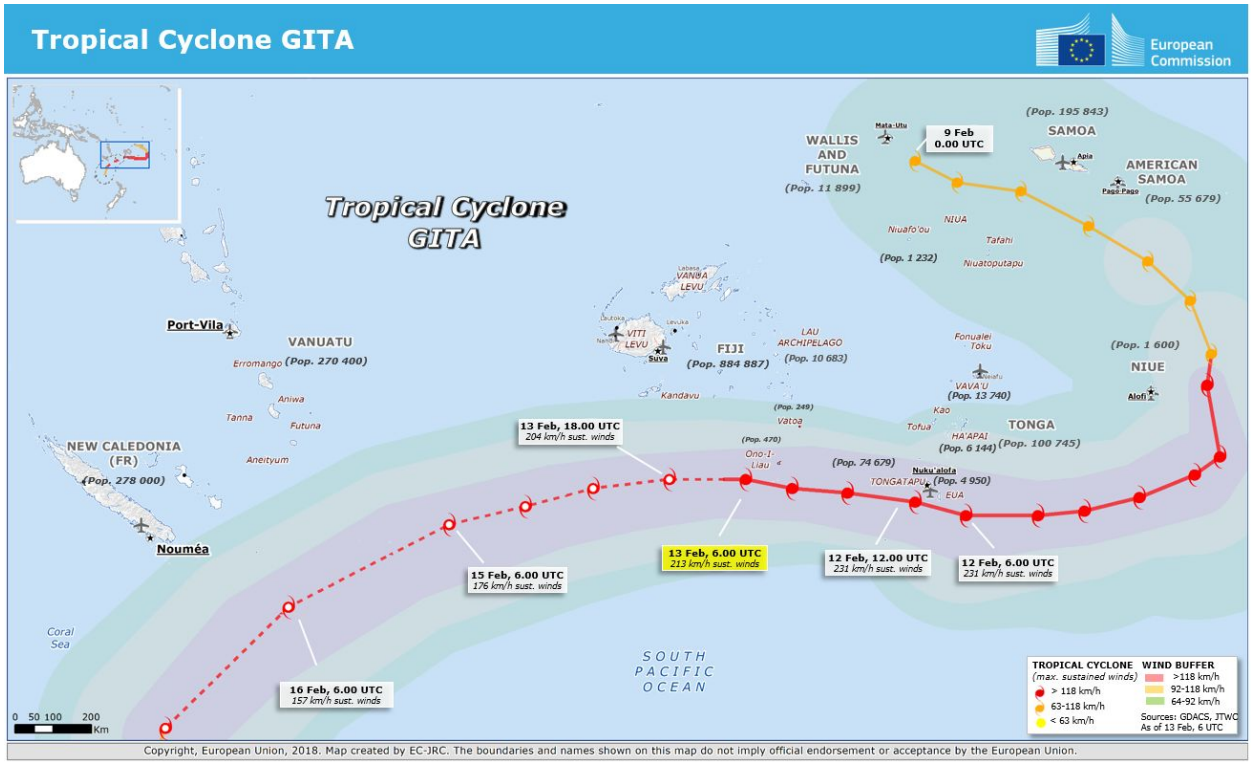


***Figure 2** - TC GITA in the southern Pacific Ocean (as of 13 Feb, 6.00 UTC).*

Warnings in effect

Fiji (Fiji Meteorological Service, as of 13 February morning)

- A Storm is in force for **Ono-I-Lau** and **Vatoa**.
- A Gale Warning is in force for Matuku, Totoya, Moala, Kadavu and nearby smaller islands, Lakeba and Nayau and the rest of southern Lau.
- A Strong Wind Warning is in force for the rest of Fiji.

Weather Forecasts in Tonga and Fiji after the passage of TC GITA

Tonga (**Nuku'alofa**)
Based on the ECMWF high-resolution operational model and ensemble prediction system, partly cloudy to cloudy conditions are forecast with light to moderate rain and the probability of local thunderstorms and showers. Winds mainly from northeastern directions with 15 to 25 km/h gusting temporarily up to 45 km/h. Maximum temperatures will be reaching 27 to 29 deg Celsius with minimum locally at 24 to 26 deg Celsius.

Fiji (**Ono-I-Lau)**

Based on the ECMWF high-resolution operational model and ensemble prediction system, partly cloudy to cloudy conditions are forecast with the possibility of local showers. Winds mainly from northwestern directions with 25 to 35 km/h gusting temporarily up to 50 km/h. Maximum temperatures will be reaching 27 to 28 deg Celsius with minimum locally at 24 to 25 deg Celsius.

2.2 Humanitarian impact

Tonga

- According to media, 3 serious and 30 minor injuries have been reported in Tongatapu island and several buildings have been damaged in the two affected islands of Tongatapu and Eua due to the strong winds. The parliament building in the capital Nuku'alofa has been badly damaged and the airport is currently closed. Roofs have been torn apart. The roads of the two islands are affected by floods and debris flows.
- According to the Evacuation Center Assessment Report published in VOSOCC web site, **969** houses have been partly damaged, 95 totally destroyed; about **3 900** people are evacuated in Evacuation Centers (ECs). Most of the people in ECs people have had their homes partially damaged - roof, walls and water facilities damage. Water contamination to most water tanks make them undrinkable but useful for other usage (VOSOCC).
- The government of Tonga has declared a **state of emergency** for the whole country (Tonga Gov).
- The Pacific Humanitarian Team, through its partners, stands ready to support the people and governments of the countries affected by Tropical Cyclone Gita should a request be made for international assistance (UN OCHA Flash Update 1)
- The Emergency Response Coordination Centre (ERCC) is also closely monitoring the situation, in coordination with a DG ECHO field expert who is being deployed to the region.

Tonga - Situation *(as of 13 Feb morning, Media, VOSOCC)*	
Fatality	**1 (not confirmed)**
People Injured	**33** (3 serious and 30 minor injuries)
Households damaged, destroyed	**969** partially damaged, **95** totally destroyed
People evacuated	**3 900** people inside **48** evacuation centers
Areas mostly affected	**Tongatapu**, including the capital **Nuku'alofa**, and **Eua**

***Table 1** - Situation in Tonga (as of 13 Feb morning).*

Fiji

Fiji - Situation *(as of 13 Feb morning, Media)*	
Fatality	*not yet reported*
People Injured	*not yet reported*
Households damaged, destroyed	*not yet reported*
People evacuated	*not yet reported*
Areas mostly affected	**Ono-I-Lau** (**Lau islands**)

***Table 1** - Situation in Fiji (as of 13 Feb morning).*

3 JRC involvement

3.1 GDACS alert

The Joint Research Centre (JRC) is following this event through the information automatically collected and analysed in the Global Disasters Alerts and Coordination System (GDACS). GDACS issued a **RED** alert on 11 February for Tonga Islands. The Current Alert level (related to future impact) is **GREEN,** maintaining the overall alert level to RED for this event .

3.2 Copernicus EMS activation

The Copernicus Emergency Management Service (Rapid Mapping service module) was activated (EMSR269) by DG ECHO on 12 February at 16:02 UTC for the west part of Tonga for the following areas: **Fahefa**, **Fatai**, **Houma**, **Kolovai**, **Nuku'alofa**, **Veitongo**.
The areas have been defined in agreement with the project manager of the ongoing International Disaster Charter call (activated by UNOSAT-UNITAR).
While waiting for optical acquisitions from the Charter, Copernicus EMS is producing delineation maps based on very high resolution radar images over the Areas Of Interest (AOI) shown in the figure below, while the list of the maps with some basic information and the status are provided

in Figure 4. The first products for the activation are foreseen to be delivered by 14th Feb morning and will be accessible at: http://emergency.copernicus.eu/EMSR269

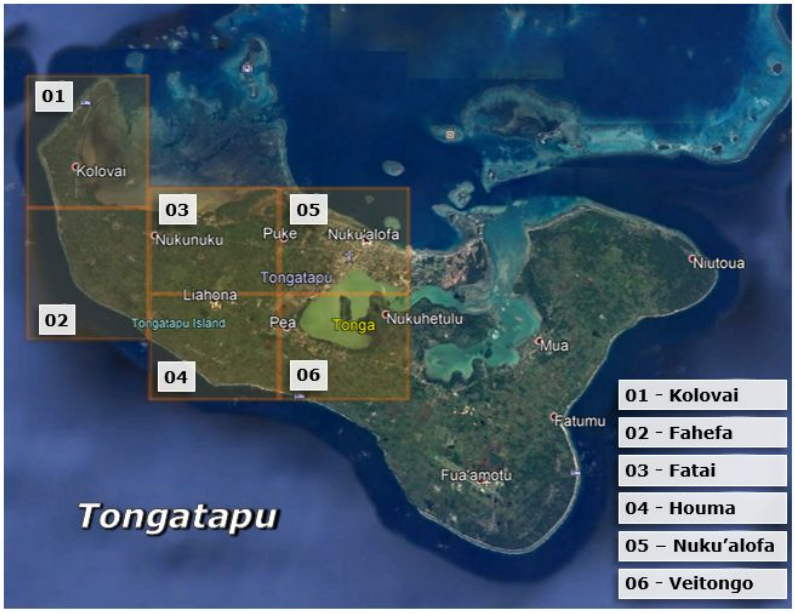


Figure 3 *- Copernicus EMS AOI for TC GITA in Tonga.*

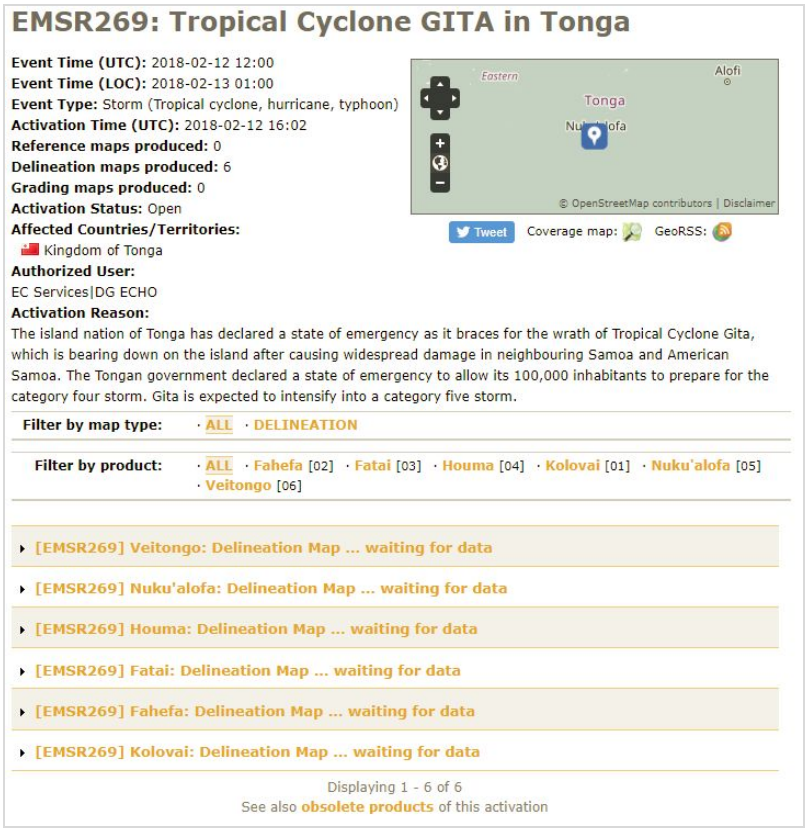


Figure 4 *- Copernicus EMS Activation for TC GITA in Tonga.*

4 Other activities in support to ERCC

4.1 JRC Support to ERCC

The first JRC Emergency Report related to the event was prepared on 12 February morning and an updated version in the afternoon of the same day. The current report is an update of the situation and includes only the new information.

In addition to GDACS alerts, JRC provided updated information on TC GITA since 9thFeb in its ECHO Daily Flash reports, available at http://erccportal.jrc.ec.europa.eu/ECHO-Flash. Daily maps on 12thFeb and 13thFeb were dedicated to this event and are published on the ERCC Portal and distributed to all Member States. The maps are available at http://erccportal.jrc.ec.europa.eu/Maps/Daily-maps

4.2 Virtual OSOCC

A new breaking emergency discussion has been initiated in VOSOCC web site on 12thFeb.

UN-OCHA is following the situation but for the moment there has been no request for pre-positioning of an UNDAC team. OCHA FCSS is in touch with the OCHA Regional Office in Suva, Fiji, who are closely monitoring the Cyclone.

Several Humanitarian teams are following the situation, waiting for an official request of assistance from Tonga authorities, that did not yet come as of 13 Feb 2018 12:00 UTC.

4.3 International Charter

UNITAR-UNOSAT on behalf of United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Regional Office for Asia and the Pacific (ROAP) activated the International Charter of Major Disasters (Activation ID 566), https://goo.gl/m1fRNw .

5 Expected Updates

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

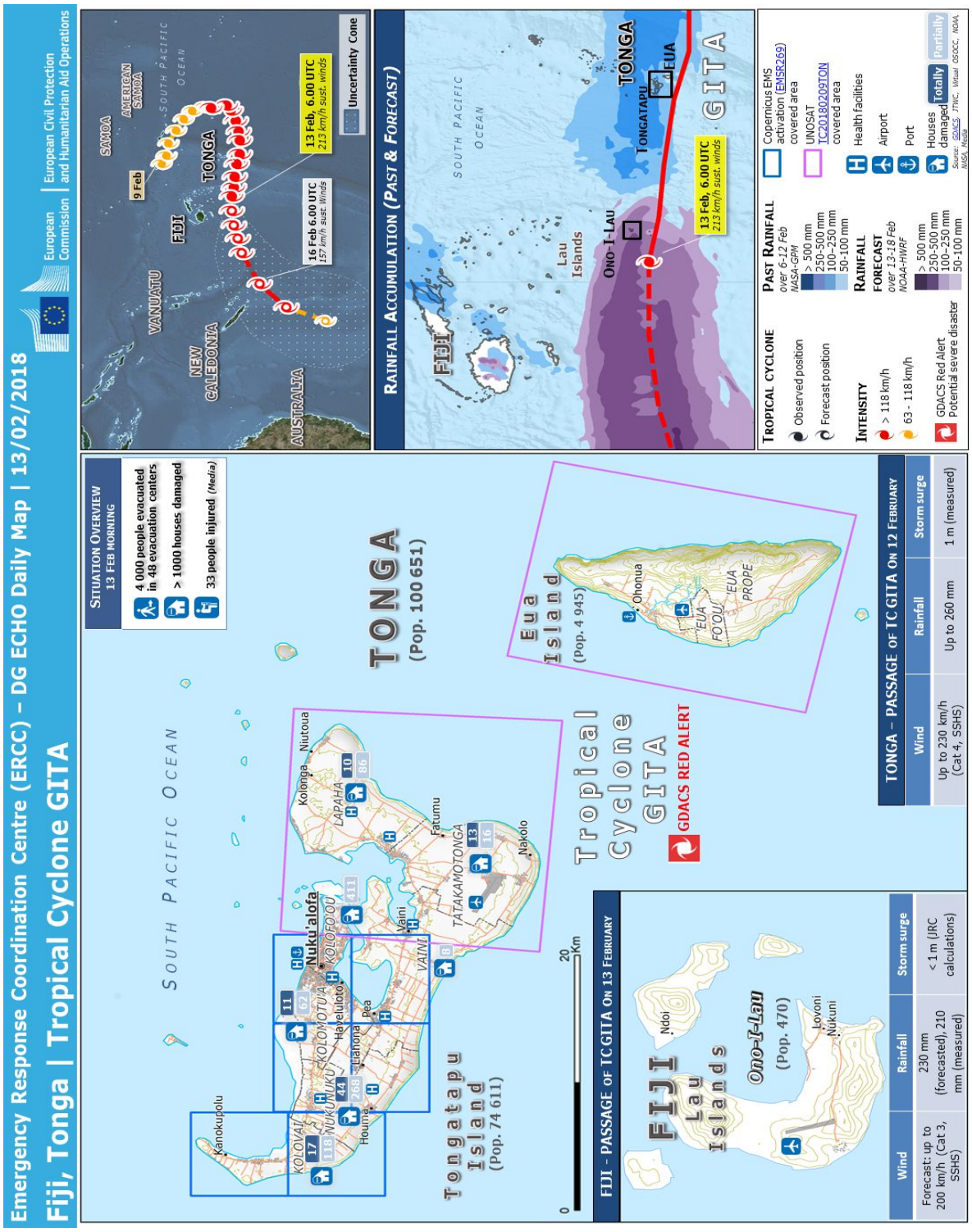
6 References and contact points within JRC

Contact points within JRC: Disaster Risk Management Unit
- Ian Clark, ian.clark@ec.europa.eu
- Alessandro Annunziato, alessandro.annunziato@ec.europa.eu
- Pamela Probst, pamela.probst@ec.europa.eu

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

- GDACS: http://www.gdacs.org/media.aspx?eventid=1000436&eventtype=TC
- ERCC portal: http://erccportal.jrc.ec.europa.eu/
- Copernicus: http://emergency.copernicus.eu/mapping/list-of-components/
- Tonga Meteorological service http://www.met.gov.to/ (site very busy, not accessible at the moment)
- Fiji Meteorological Office http://www.met.gov.fj/index.php
- NOAA-HWRF: http://www.emc.ncep.noaa.gov/gc_wmb/vxt/HWRF/tcall.php?selectYear=2018&selectBasin=Southern%20Hemisphere&selectStorm=GITA09P
- JTWC: http://www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/warnings/sh0918.gif

Annex 1 - Detailed Map on the Tropical Cyclone



Annex 2 - GDACS Alerts

JRC is responsible for the operation of GDACS, that plays a major role in alerting the international community to humanitarian emergencies during natural disasters. The alerts of GDACS (Green, Orange, Red) are elaborated based on the severity of the event, the population involved and the vulnerability of the countries. GDACS also sends e-mail and SMS alerts to subscribed recipients. A detailed description of GDACS can be found in the GDACS Guidelines available at: http://www.gdacs.org/Documents/GDACS%20Guidelines%202014_-_FINAL.PDF

GDACS ALERTS		
	**GREEN ALERT**	Moderate event, International Assistance not likely
	**ORANGE ALERT**	Potential local disasters, International Assistance might be required
	**RED ALERT**	Potentially severe disasters, International Assistance is expected to be required

Tropical Cyclones have three dangerous effects (strong winds, storm surge and heavy rain).

Wind

The GDACS alert levels for the TCs are based on the risk formula that includes:

- TC wind speed (hazard)
- Population affected
- Vulnerability of the affected country

The overall alert for a Tropical Cyclone comes from **wind effects.**

Storm Surge

Storm surge is an abnormal rise of water above the predicted astronomical tides, generated by strong winds and by a drop in the atmospheric pressure. It was implemented in the HyFlux2 code, routinely used in GDACS to model inundation due to tsunami run-up.

The GDACS alert levels are based on the maximum storm surge height:

- Green when the storm surge is below 1.0m;
- Orange when the storm surge is between 1.0m and 3m;
- Red when the storm surge is above 3m.

It should be noted that the estimation of the sea level is strongly dependent on the initial data for the wind velocity and direction and the sea level change according to each bulletin that was available

JRC is preparing a new alert system that will include all the effects.

TC Classification used in GDACS

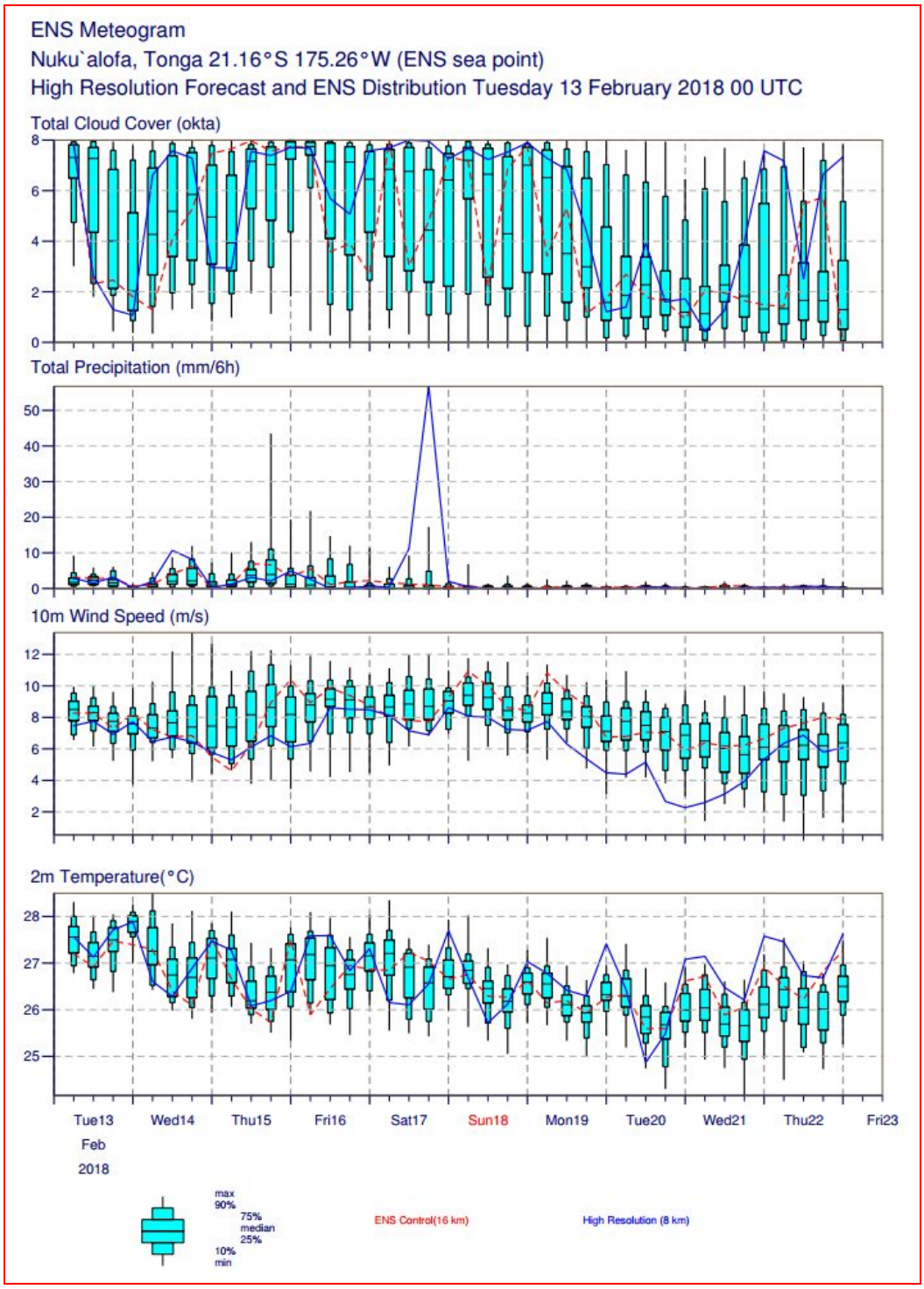
The equivalent Category based on the Saffir-Simpson Hurricane Wind Scale (SSHS) is also indicated in GDACS. The SSHS is the official scale used by NOAA-NHC for the North Atlantic TC basin and is a scale from 1 to 5, based on the hurricane's 1-min sustained wind speed and it estimates the potential property damage (see table below).

Saffir-Simpson Hurricane Wind Scale (SSHS)		
Hurricane CATEGORY	**1-min sustained winds (km/h)**	**Types of Damage Due to Hurricane Winds**
Cat. 1	119 - 153	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Cat. 2	154 - 177	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks
Cat. 3 *Major Hurricane*	178 - 208	**Devastating damage will occur**: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes
Cat. 4 *Major Hurricane*	209 - 251	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
Cat. 5 *Major Hurricane*	≥ 252	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months

TC Classification (Saffir-Simpson Hurricane Wind Scale)
see NOAA-NHC: http://www.nhc.noaa.gov/aboutsshws.php

Annex 3 - Weather forecasts for Nuku'alofa

ECMWF Meteogram for Nuku'alofa of closest ensemble (sea) grid point at 7 km south west



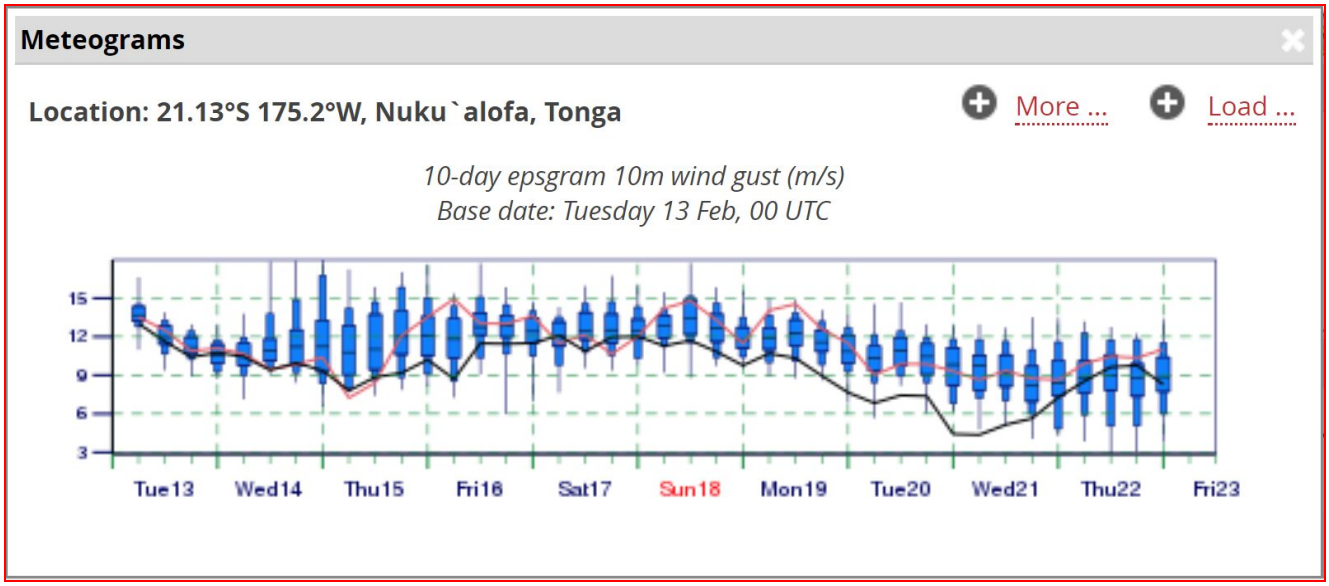
For the description of the meteograms meaning please refer to the first report.

The first panel of the meteogram contains the total (low- medium- and high-level) cloudiness in octas. It becomes obvious that a temporal breaking of clouds is expected during Tue (13 Feb) and Wed (14 Feb) whereas a gradual increase of the cloudiness is forecast from late hours of Wed (14 Feb) and Thu (15 Feb) onwards.

The second panel refers to the total (convective and large-scale precipitation) utilising values estimated over 6-hour intervals. HIRES seems to forecast higher values than the Control and most of the ensemble members with a maximum of ~11 mm/6h during the noon / afternoon hours of Wed (14 Feb).

The third panel refers to the instantaneous (averaged over 10 minutes) wind speed with HIRES values ranging 15 to 25 km/h during Tue and Wed (13 & 14 Feb) mainly from northeastern directions whereas a considerable number of ensemble members forecast values well above 30 km/h. HIRES wind gusts (see diagram below) forecast values ranging 35 to 50 km/h whereas some of ensemble members forecast values overtopping 50 km/h.

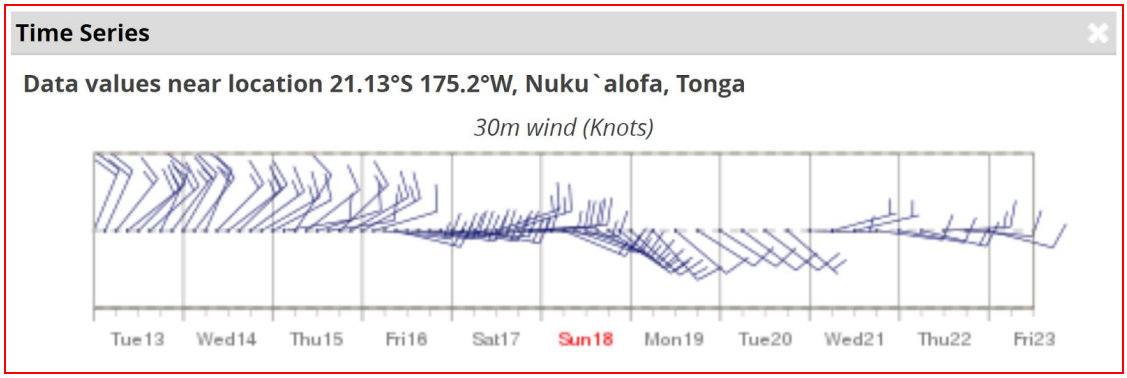
ECMWF pinpoint forecast of wind speed gusts at 10 meters for Nuku'alofa



The fourth panel refers to the temperature at 2 meters that seems to be in slight gradual drop after the passage of the tropical cyclone.

Additional diagrams are added below referring to wind direction and speed at the height of 30 meter height. The probability of precipitation type is also presented (last diagram).

ECMWF pinpoint forecast of wind speed and direction at 30 meters for Nuku'alofa



ECMWF pinpoint forecast of probability of precipitation type for Nuku'alofa