Sea Level Stations Operation in Nicaragua

1. Date of report**: March 3, 2018**

2. Title: **Report of Sea Level Station Operations in NICARAGUA**

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4. Map of tide gauge network

The seal level station network is operated by Hydrology Department. The main propose of the network is monitoring the seal level for tidal prognostic. At the present time, the hydrology department have five sea level stations, three stations are working (Corinto, Puerto Sandino y Corn Island) and two stations are offline (El Bluff) and San Juan del Sur.

Figure 1. Map of sea level stations

Location of sea level station

Corn Island Station in the Caribbean

Figure 2. Corn Island station

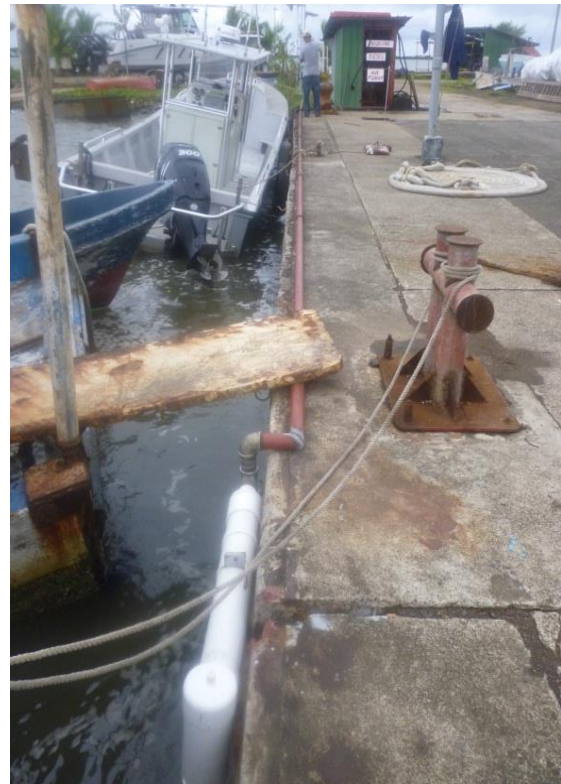# Bluefield Station in the Caribbean

Figure 3. El Bluff station

Corinto Station in the Pacific Coast

Figure 4. Corinto station

Puerto Sandino Station in the pacific coast

Figure 5. Puerto Sandino station

San Juan del Sur Station, Pacific Coast

The station was retired because the DCP is damaged.

Figure 6. San Juan del Sur station

5 Tide Gauge Stations

The following tables show the information about location, code, status and operator's network as well we show the parameter of the stations and technology used,

Name:	**CORN ISLAN (CARIBBEAN**
Station Code:	61-00-01
Lat	12° 19' 38"
Long	83° 04' 04"
Date Installed	Junio 2014
Status	Operational
Operator:	INETER

Name:	**PUERTO CORINTO (PACIFIC COAST)**
Station Code:	64-00-01
Lat	12° 29' 00"
Long	87° 10' 03"
Date Installed	Junio_2011
Status	Operational
Operator:	INETER

Name:	**PUERTO SANDINO (PACIFIC COAST)**
Station Code:	68-00-01
Lat	12° 12' 04"
Long	86° 45' 52"
Date Installed	Diciembre_2013
Status	Operational
Operator:	INETER

Name:	**San Juan del Sur (PACIFIC COAST)**
Station Code:	72-00-01
Lat	11° 15' 04"
Long	85° 52' 30"
Date Installed	Noviembre_2012
Status	Retired/Offline
Operator:	INETER

Name:	**El Bluff (Caribbean)**
Station Code:	61-00-02
Lat	11° 59' 53"
Long	83° 41' 28"
Date Installed	June, 2014
Status	Operational
Operator:	INETER

Technology employed in each tide gauge stations

Name of Station	CORN ISLAND (ATLANTICO)
Communications	GOES
GOES PID	22178120
WMO Header: N/A	NO
GOES Channel	173
Transmit Period	01h:00':00"
Sampling Rate	00h:10'00"
GLOSS Station ID	
DCP	XLITE 9210 SUTRON
GPS (timing)	
GPS (high precision for positioning)	YES (GARMIN)
Sensor #1	Pressure
Met Sensors	Tiping bucket and Temperature of the water

Name of Station	PUERTO CORINTO (PACIFICO)
Communications	GOES
GOES PID	050284CA
WMO Header: N/A	NO
GOES Channel	145
Transmit Period	01h:00'00"
Sampling Rate	00h:10'00"
GLOSS Station ID	
DCP	X LITE 9210 SUTRON
GPS (timing)	
GPS (high precision for positioning)	YES Garmin
Sensor #1	Pressure
Met Sensors	Tiping bucket , Temperature of the water and wind speed and Velocity

Name of Station	PUERTO SANDINO (PACIFICO)
Communications	GOES
GOES PID	0500F7AE
WMO Header: N/A	NO
GOES Channel	173
Transmit Period	01h:00'00"
Sampling Rate	00h:10'00"
GLOSS Station ID	
DCP	X LITE 9210 SUTRON
GPS (timing)	
GPS (high precision for positioning)	YES Garmin
Sensor #1	pressure
Met Sensors	Tiping bucket , Temperature of the water and wind speed and Velocity

No Operational

Name of Station	Puerto de San Juan del Sur (Pacifico)
Communications	GOES
GOES PID	0500A7D2
WMO Header: N/A	NO
GOES Channel	73
Transmit Period	01h:00'00"
Sampling Rate	00h:10'00"
GLOSS Station ID	
DCP	X LITE 9210 SUTRON
GPS (timing)	
GPS (high precision for positioning)	YES
Sensor #1	pressure
Met Sensors	Tiping bucket , Temperature of the water and wind speed and Velocity

7. Leveling:

We installed Benchmarks for each station.

- Corn Island has two BM installed in 2014.
  Leveling : October 3, 2014

- Corinto has 3 BM, one was installed in 1956 y two in 1986.
  The last leveling was in September 04, 2014.

- Puerto Sandino has 2BM, one was installed in 1956 and the second was installed in 1986.
  Las leveling was on September 06, 2014.

- San Juan del Sur has 3BM, one was installed in 1958, and two in 1992.
  Last leveling was on March 22, 2014.

8. An overview of the data availability

Data is available in website of INETER and IOC

9. Web, email etc. addresses of data archives and of sources of further information

http://www.ineter.gob.ni/recuh
Contact: Sergio Cordonero
Email Sergio.cordonero@rh.ineter.gob.ni
Hydrology Deparment - Nicaragua
Instituto Nicaraguense de Estudios Territoriales (INETER)

10. Future Plans.

The hydrology unit has project to install new sea level station to increase the network and obtain more data..

Tsunami Monitoring system and early warning in Nicaragua.
The Geophysical Direction has the project to install 8 tide gauge station in the Pacific and Atlantic coast in Nicaragua in order to monitoring the tsunamis.
- Data Transmition : real time
- Communication via 3G / RF
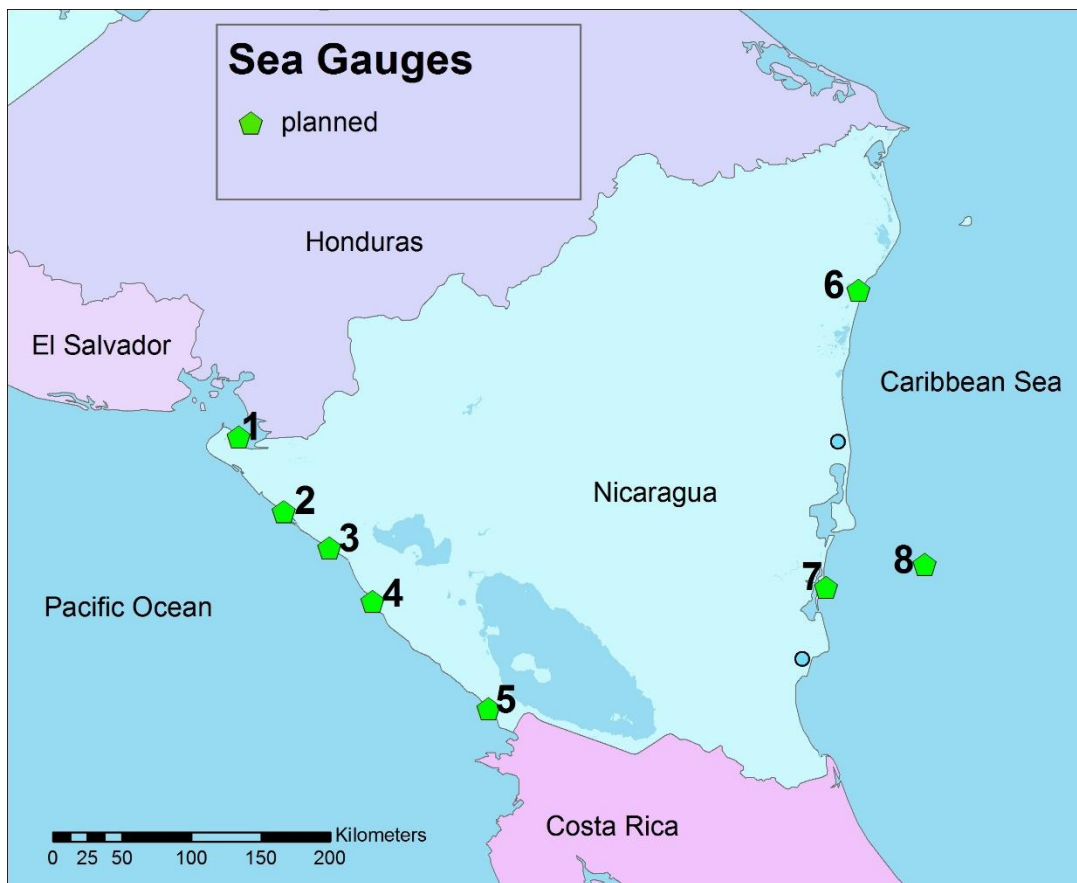
Location proposed

1. Potosí, Cosigüina, 2. Puerto Corinto, 3. Puerto Sandino, 4. Masachapa, 5. San Juan del Sur

6. Bilwi (Puerto Cabezas), 7. El Bluff, 8. Corn Island

Tidal Analysis and quality control

Tide gauge stations and analysis

For the practice we choice three stations Guadalupe.We downloaded 12 months of data from IOC Sea Level Monitoring Facility from 1st March 2017 to 6th February 2018.

We use Quick convert to obtain files *.CSV and then we use those files *.CSV as inputs for Task Toolkit application and we get one file with *.t2k format with amount of harmonics for analyses.

I show the file *.t2k output of TaskToolkit and two file output of Task Analyze, one file contain the harmonic constants and another is the new file TK2. The result for this station are   54 harmonics and
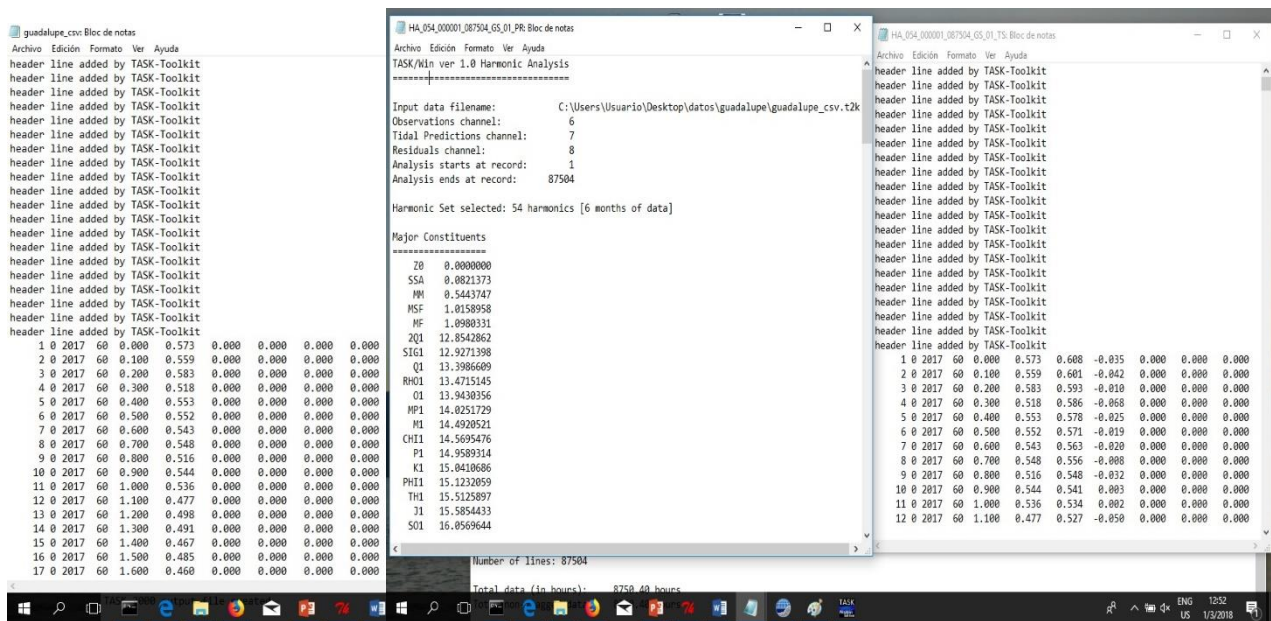
We started the TASK-plot in order to apply the quality control to data. The figure shows the wave form in blue color is the prediction and the purple color as residual. We will check the data for spikes, gaps etc and flag data accordingly.

We checked the data and active the flagging mode. We show in red crosses the spikes and gap in the data.

The figure shows anomalies in the record due to Hurricane hit the station.
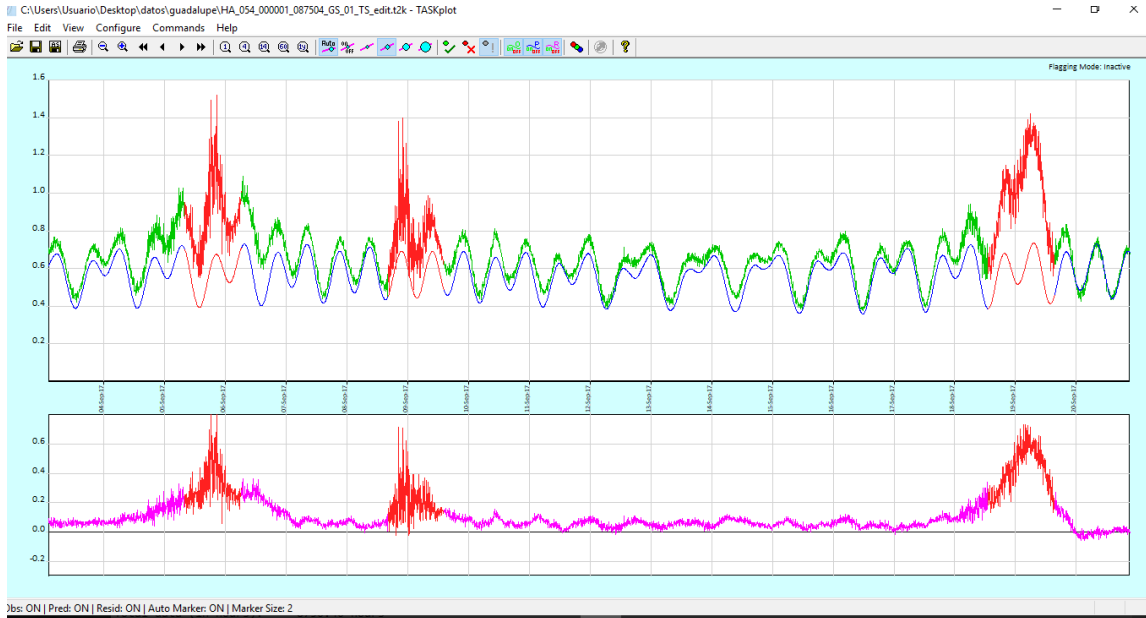
Conclusion:

We do practices of TASK software to analyze the quality control of data and Tide tool programs for sea level monitoring in real time. Tide Tools let us to see in real time if the tsunami happens in order to provide to local authorities.