Marinemet Project
Tide Gauges and AWS stations

Afrimet

Conference of Directors of the West African National Meteorological and Hydrological Services

Nouackchott, 19-21 April 2016

About Marinemet network

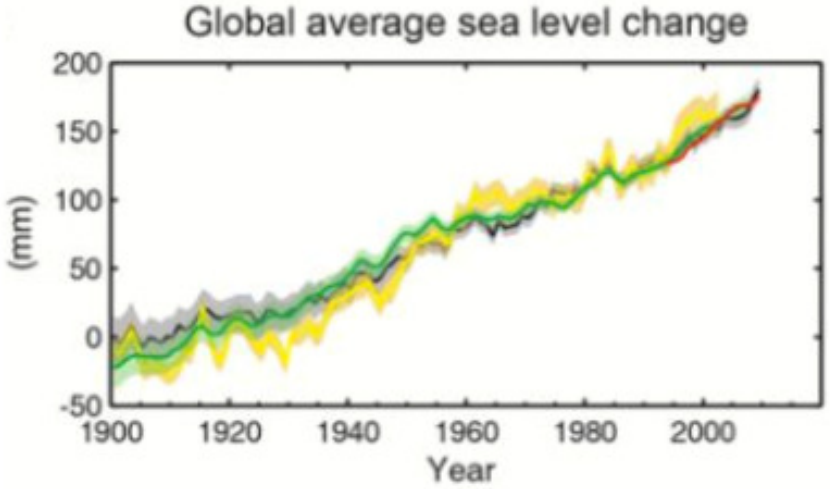
- Objective: increase availability of oceano-meteorological data in the region for local, national, regional and global applications.
- Measurement of several Essential Climate Variables according to the Global Climate Observing System (GCOS)
- Strong focus on sea level and tides: "sea level" one of the key Essential Climate Variables of the ocean
- Long-term operation challenging and costly: efforts should be made to guarantee sustainability of the stations and take greater benefits from the initial investment

Sea level data applications

Climate change and long-term mean sea level rise:

Global msl rise IPCC 2013:

- XXth century: 17-21 cm (1.8 mm/yr)
- 1993-2013: 3.3 mm/yr



Sea level data applications

Sea level hazards warning systems (global networks, real-time data):

Storm Surge Sandy 2012

Indian Ocean Tsunami Dec 2004

Sea level data applications

Satellite altimetry calibration

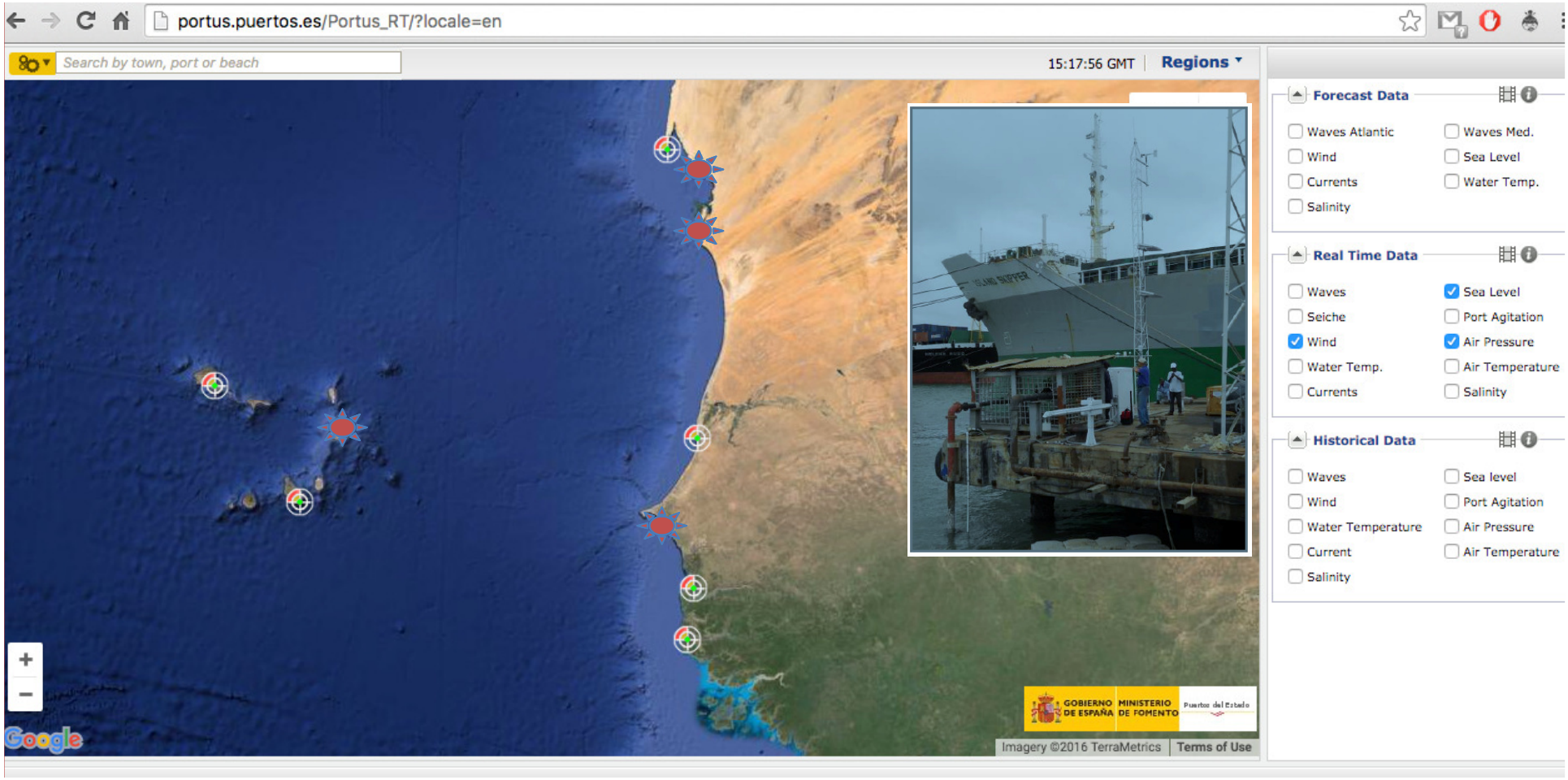
Harbour operations and construction works

Geodesy and hydrography: Sea level references

Tide prediction

Navigation

Marinemet network today

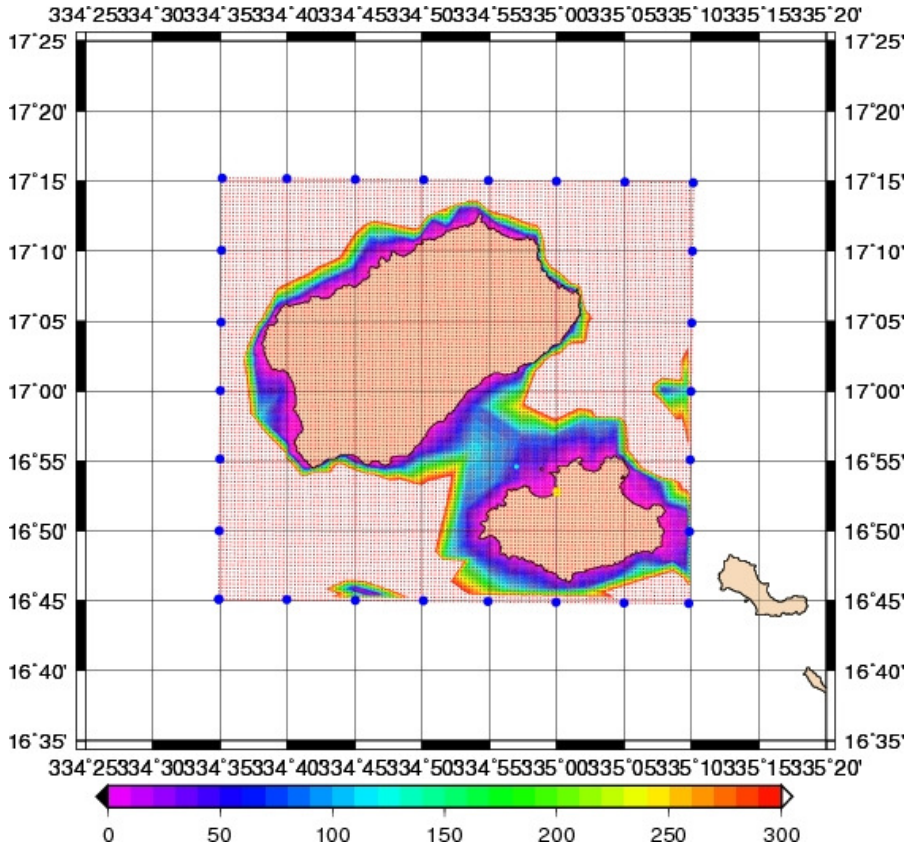


- 6 TG & AWS stations + 4 additional AWS stations
- Already operational: installed and maintained by Sutron Corp. until end of 2017. Two Miros sensors at Mindelo and Carabane

Instalation and maintenance: 2012-2017

In-situ work by Sutron Corporation and local technicians

About Marinemet network



SAPO local wave model domain for Mindelo

Miros radar sensors provide also wind-wave parameters:

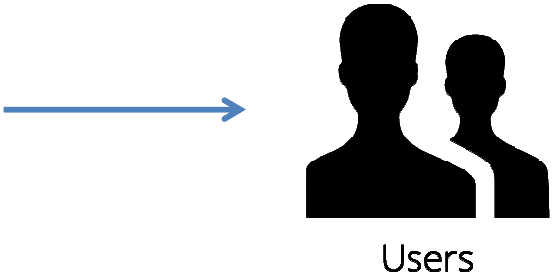
- Significant wave heigth
- Maximum wave height
- Mean Period
- Peak Period

Important at some locations such as Mindelo

Will allow validation of local wave models (SAPO)

Carabane Miros sensor needs relocation

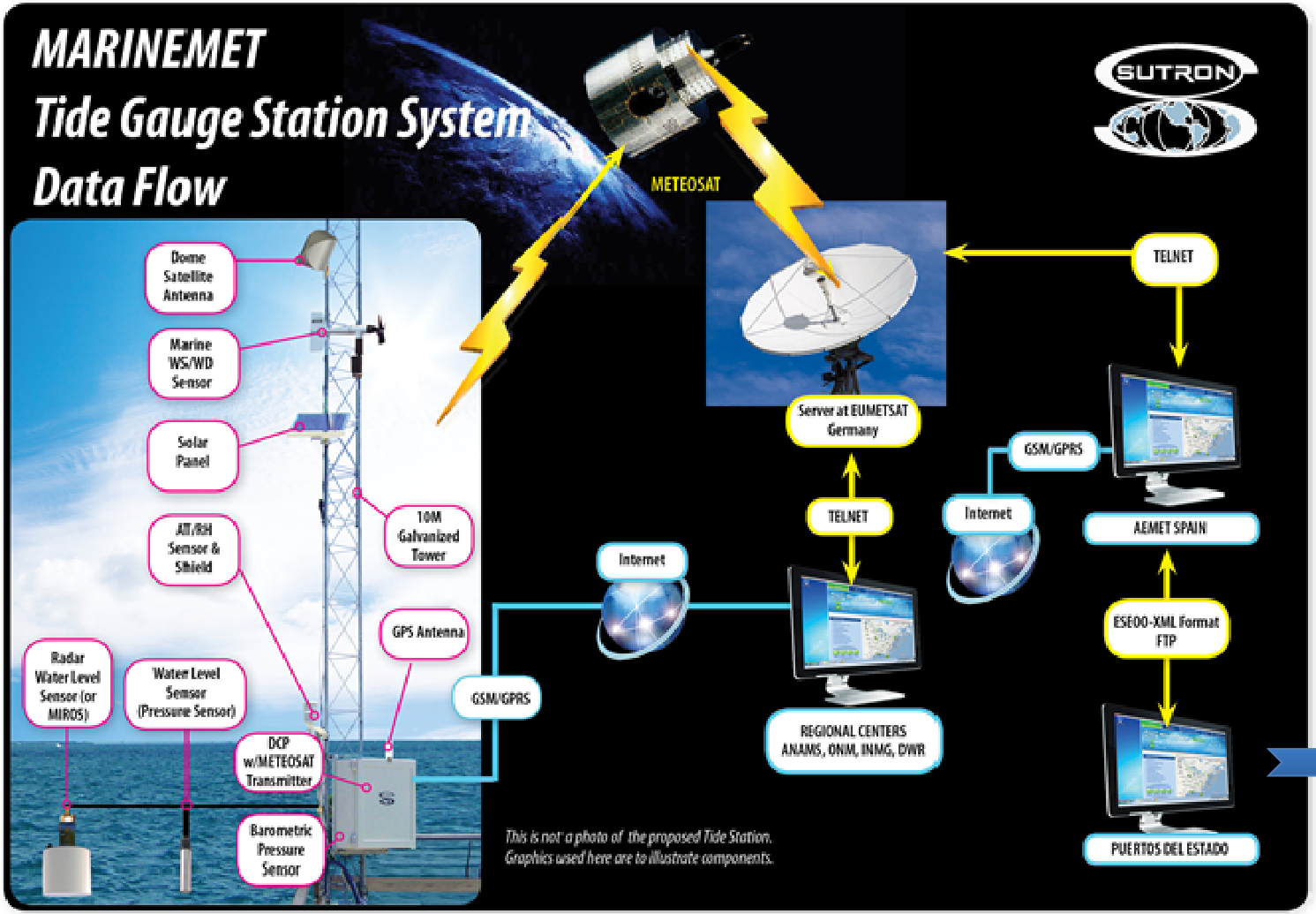
Main challenge today:



Convert measurement into information for a large and diverse variety of users

E.G.: several data portals allow today access to sea level data from TG's (such as GLOSS / IOC). Focused on different applications and users.

Data flow (from Sutron offer)



GLOSS

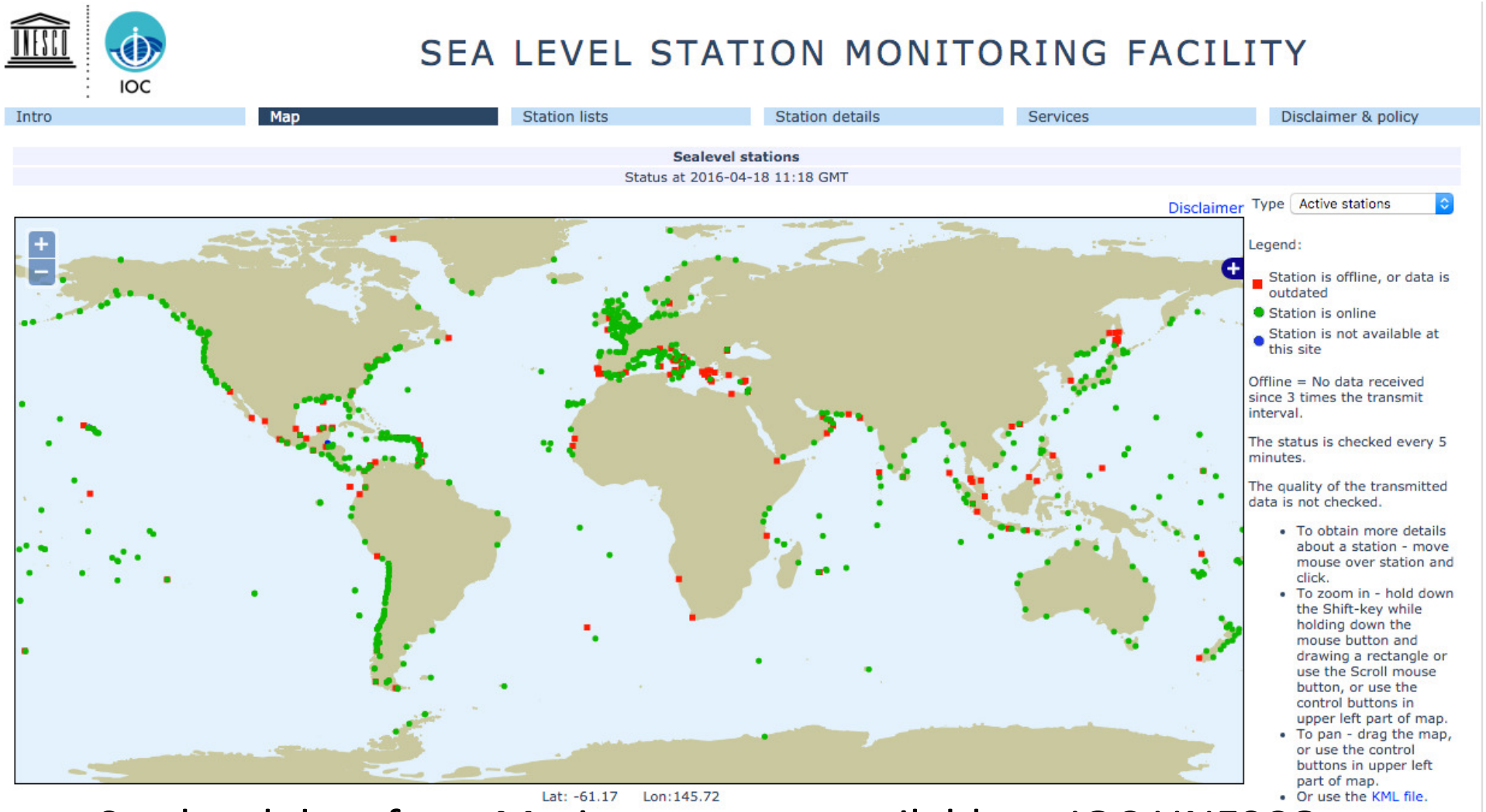
Access to Eumetsat data from regional center needs to be implemented. By now, only GPRS for national data transmission

Main Actions 2015-2016

- New WMO consultant for survey on the operational status of the stations (data transmission, data quality, etc)
- Increase surveillance from PdE personnel on quality and status of transmitted data, in support to Marinemet project
- Automatic quality control of sea level, atmospheric pressure and wind, according to PdE oceano-meteorological network procedures
- Questionnaire sent to the national contacts to identify their problems in accessing the data, level of training and funding capabilities for the future

GLOSS: Global Sea Level Observing System

http://www.ioc-sealevelmonitoring.org/map.php



Sea level data from Marinemet now available at IOC UNESCO GLOSS data portal. Very important data to fill in gap in the region !

GLOSS: Global Sea Level Observing System

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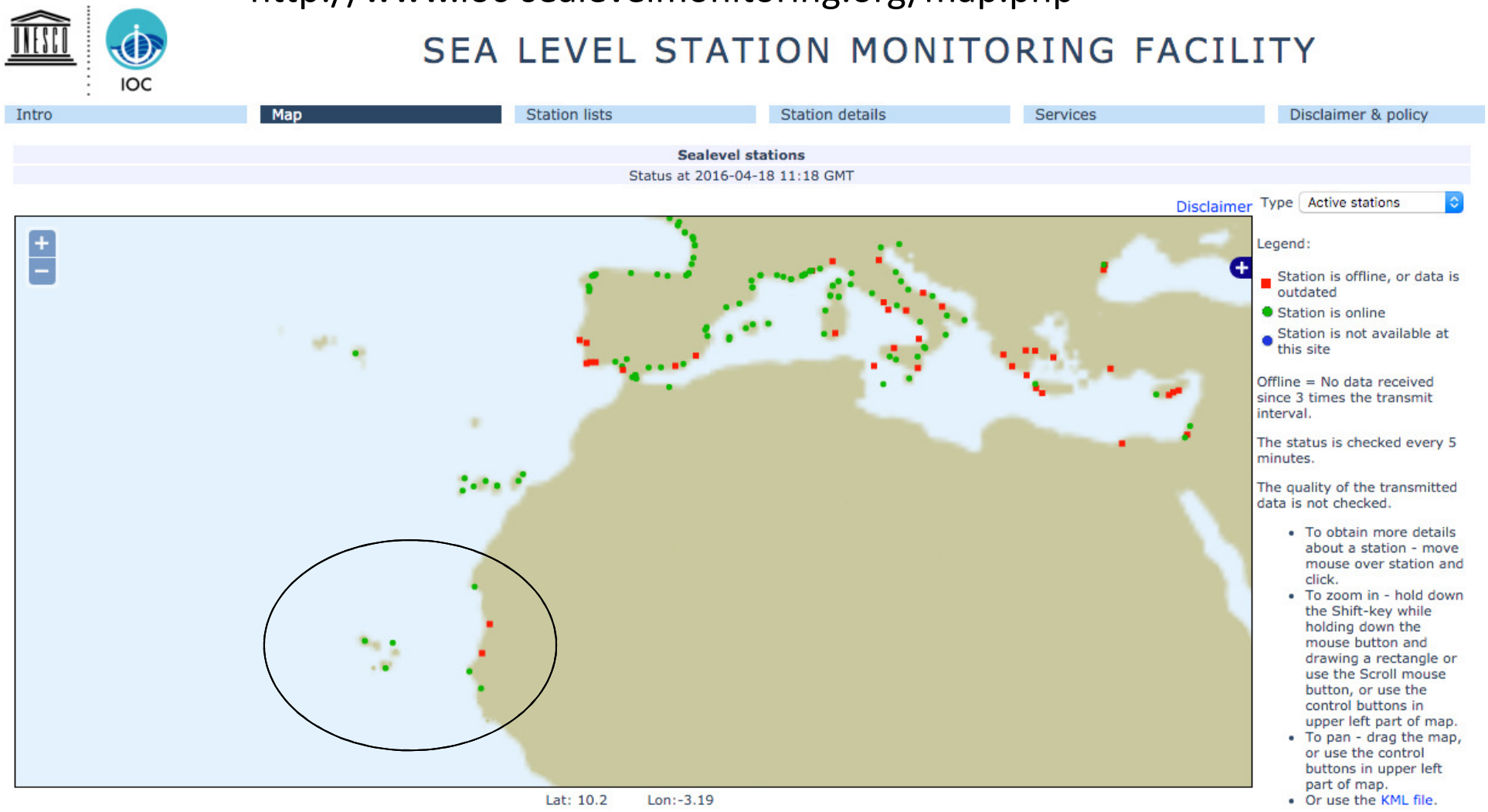

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Station html files for direct access

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MARINEMET BANJUL STATION DATA

(Data integrated in Spanish National Ports and Harbours Authority)

THE GAMBIA

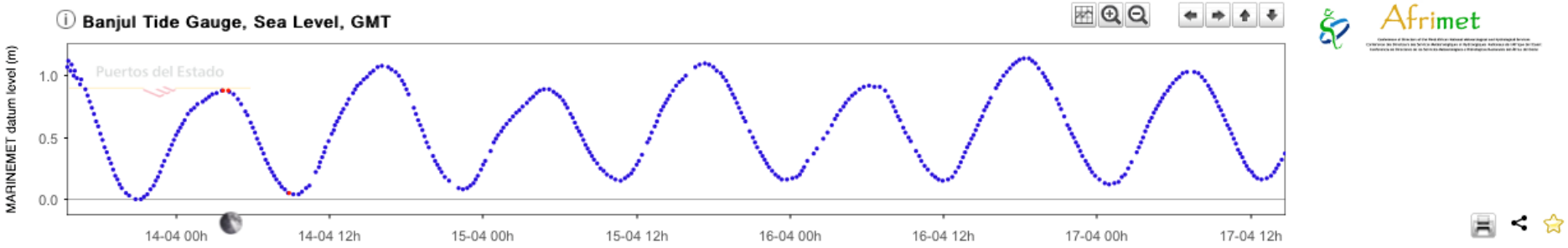
Gambia Ports Authority

Department of Water Resources

The Gambia Ministry of Environment, Climate Change, Water Resources, Forestry, Parks & Wildlife

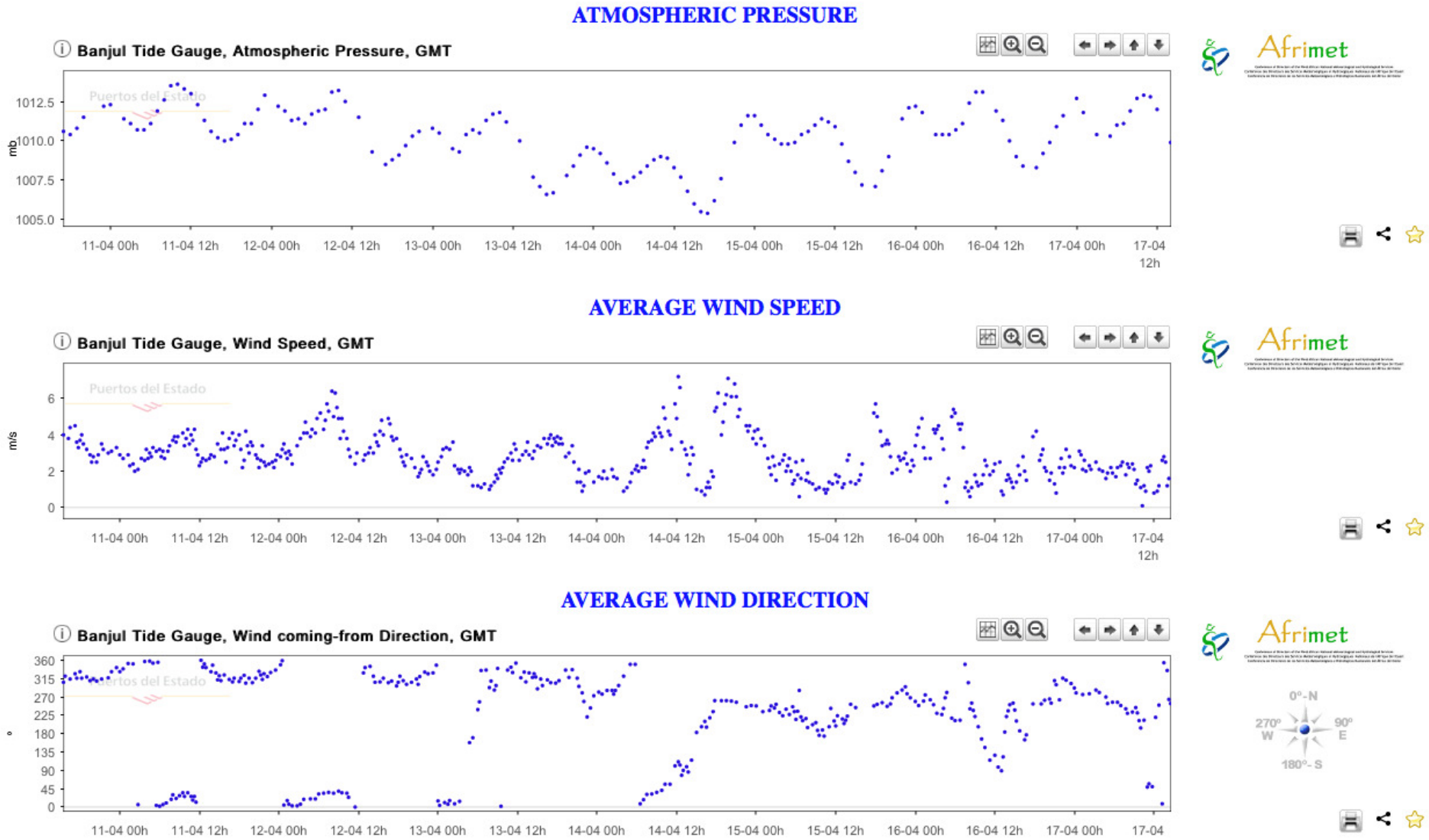
Station info | MARINEMET datum | Series

SEA LEVEL (radar)



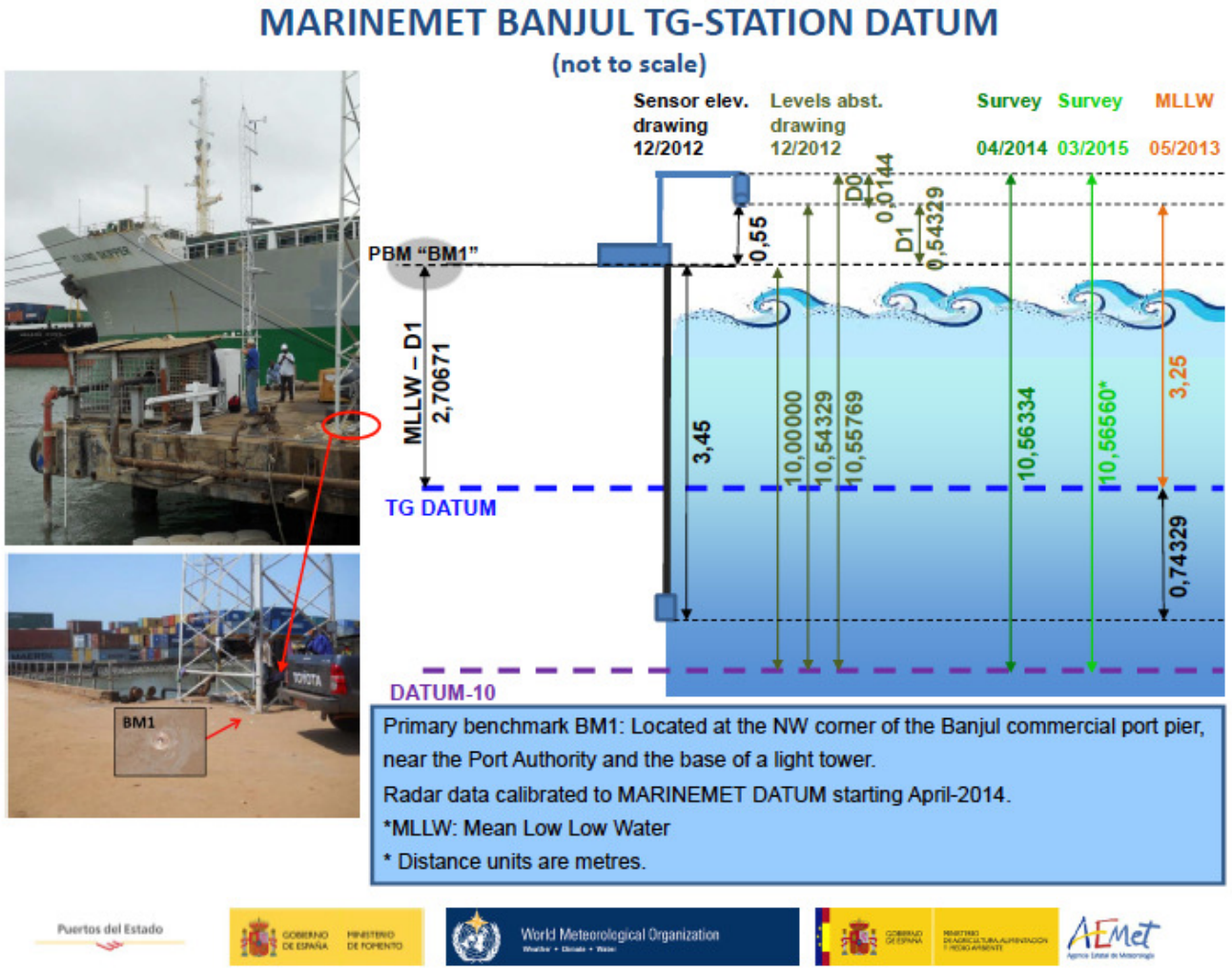
Visualization tool for local and national users, based on data displayed at Portus System in Spain (Near-real time QC in place)

Station html files for direct access



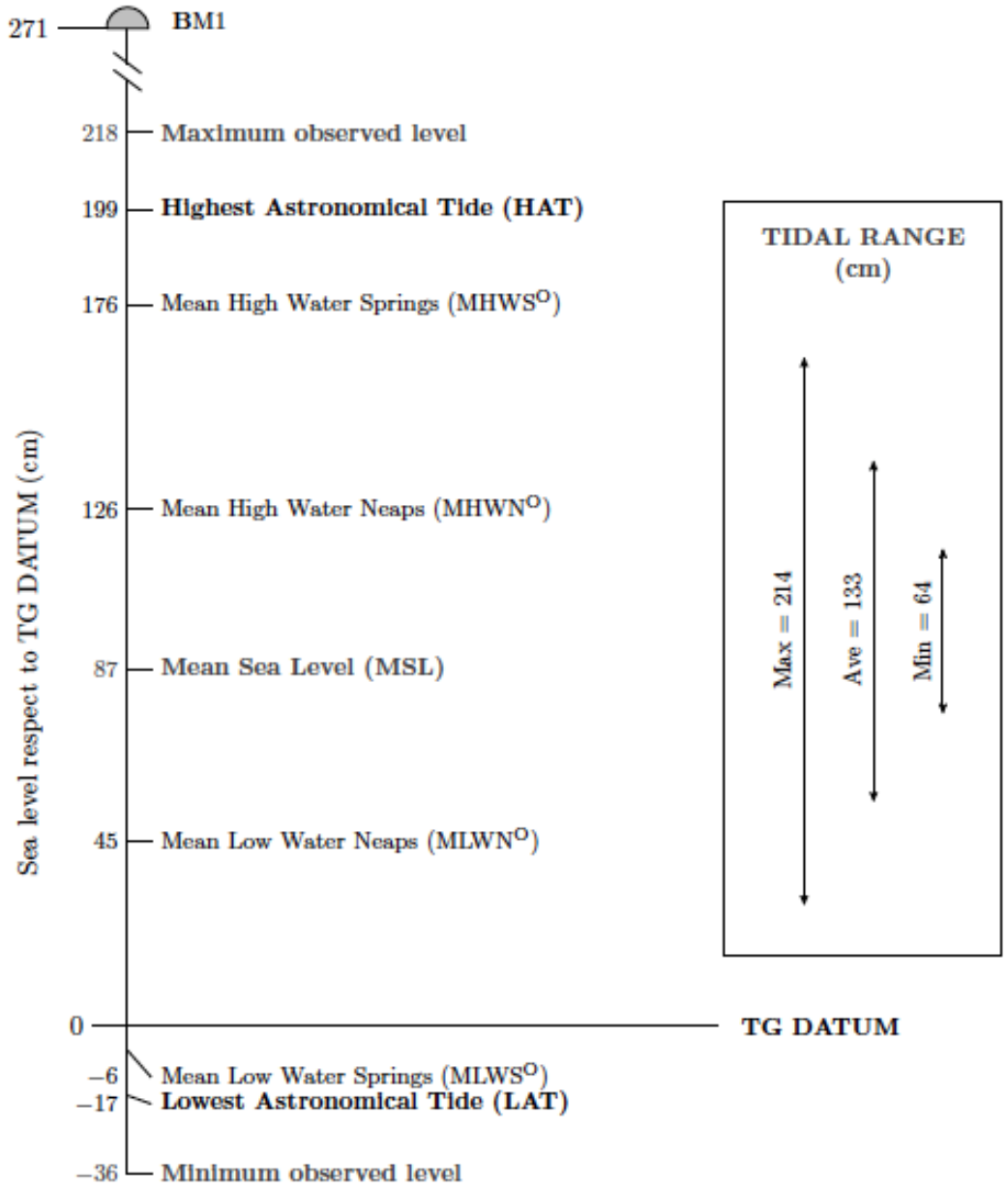
Visualization tool for local and national users, based on data displayed at Portus System in Spain (sea level, pressure and wind)

Station html files for direct access



Access to additional metadata of relevance at the station, such as sea level datum and levelling

Historical sea level data processing



Definition of main sea level references: for hydrography, tide forecast and geodesy.

Example for Banjul TG

Historical sea level data processing

Analyzed period: 1/01/15 to 04/10/15					
Constituent	Amp (cm)	Phase (◦)	Constituent	Amp (cm)	Phase (◦)
Z0	90.51	0.00	M2	59.28	288.65
SSA	9.27	67.05	MKS2	1.01	132.73
MM	2.93	2.22	LDA2	1.01	288.57
Q1	1.39	219.72	L2	2.75	304.93
O1	3.74	275.93	S2	19.45	325.55
P1	1.44	347.36	K2	6.15	315.12
K1	6.17	17.03	MN4	1.20	327.17
2N2	1.11	251.69	M4	3.00	4.48
N2	11.04	266.95	MS4	1.85	65.57
NU2	2.41	260.55			

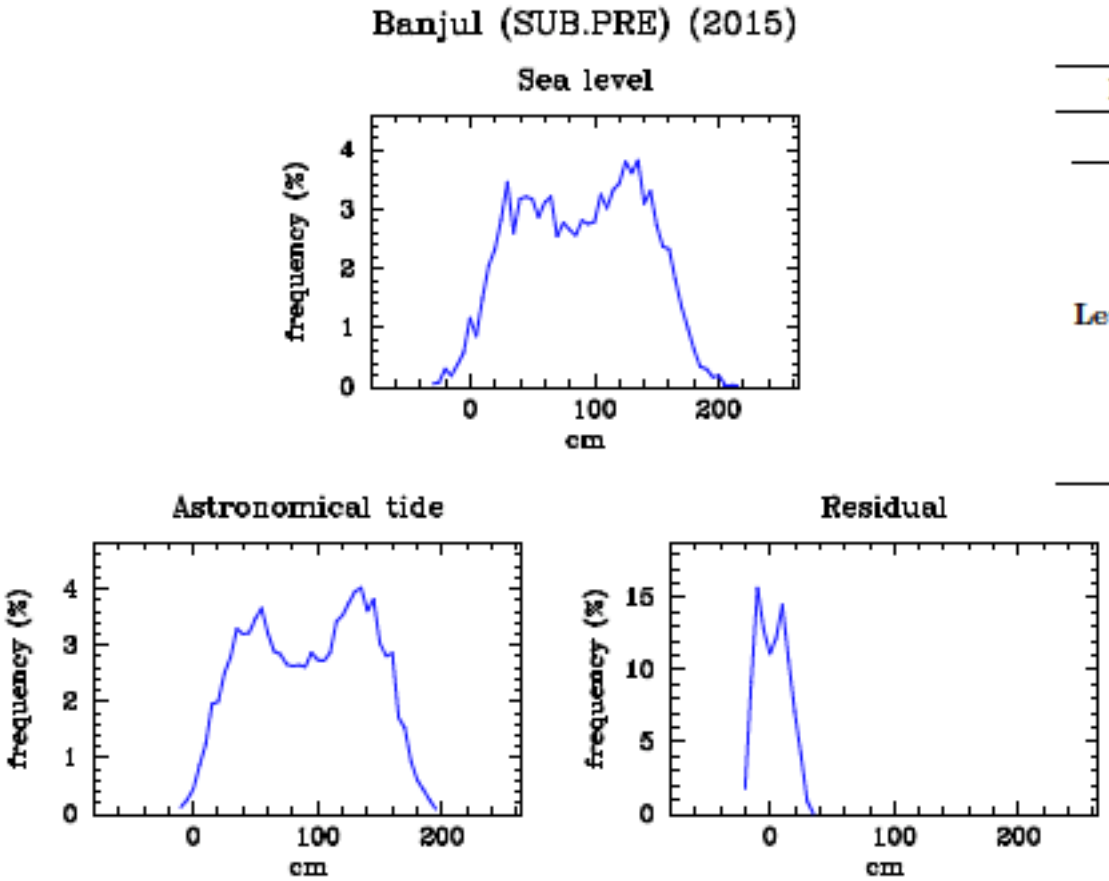
Table 4.1. Station main sea level harmonic constituents.

Computation of harmonic constants (tide), for tide forecast

Example for Banjul TG

Historical sea level data processing

Sea level components (1 hour series)

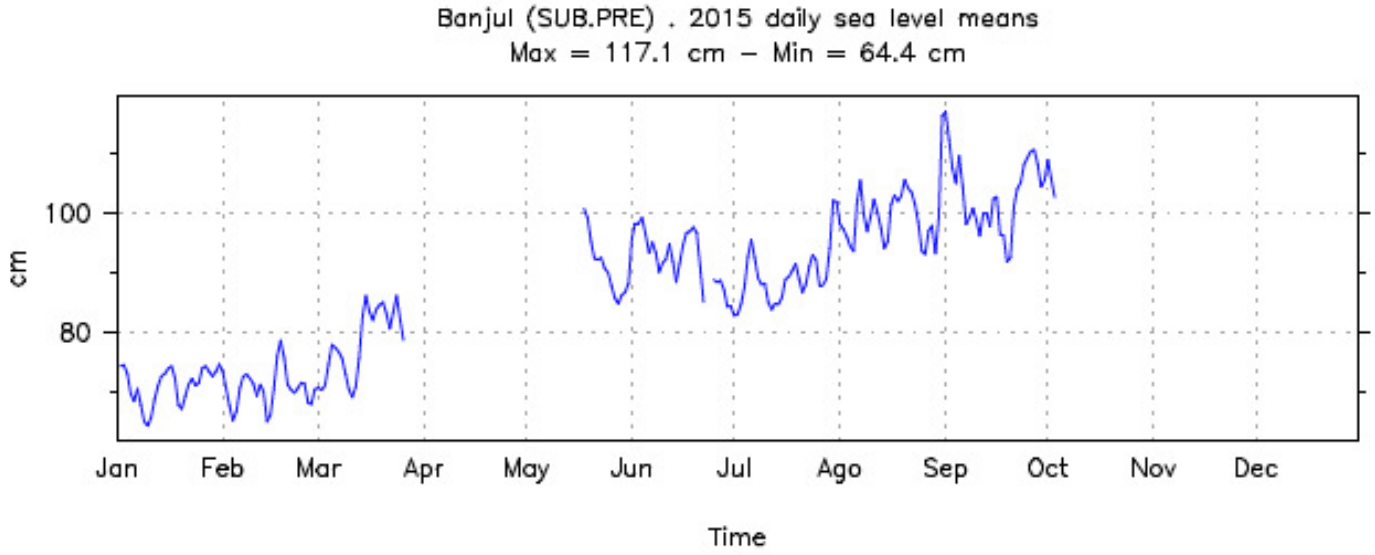


HOURLY SERIES STATISTICS (cm)					
TOTAL			COMPONENTS		
Level	max	214.4	Tide	max	195.0
	min	-33.6		min	-14.2
	mean	87.1		mean	90.5
	std	49.4		std	47.5
			Residual	max	31.1
				min	-24.9
				mean	0.0
				std	12.0

Extraction of tide and residual components. Histograms and basic statistics.

Example for Banjul TG

Historical sea level data processing



SEA LEVEL (5 MINUTE SERIES) EXTREMES													
	Monthly												TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Ago	Sep	Oct	Nov	Dec	2015
MAX	173.0 (22)	178.0 (18)	184.0 (20)	NA	186.0 (18)	179.0 (18)	188.0 (31)	218.0 (31)	210.0 (01)	193.0 (01)	NA	NA	**218.0 (31 Ago)**
MIN	-31.0 (22)	-36.0 (21)	-22.0 (22)	NA	8.0 (17)	9.0 (17)	-3.0 (03)	-16.0 (30)	-1.0 (29)	9.0 (01)	NA	NA	**-36.0 (21 Feb)**

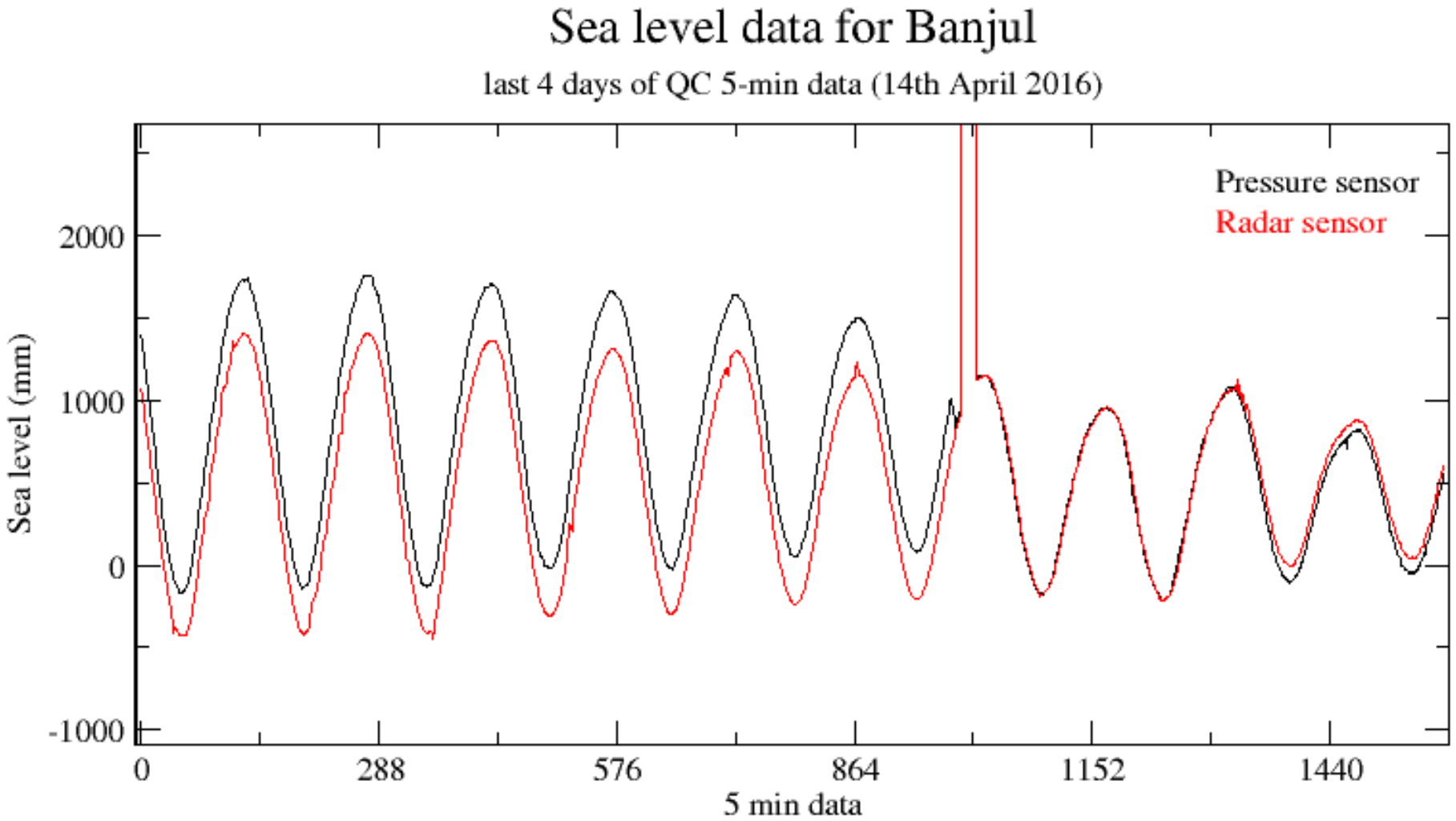
Table 4.3. Observed sea level (5 minute series) monthly and annual extremes. Day of monthly and annual extreme occurrence is indicated in parentheses.

Mean sea level evolution and extreme sea levels

Example for Banjul TG

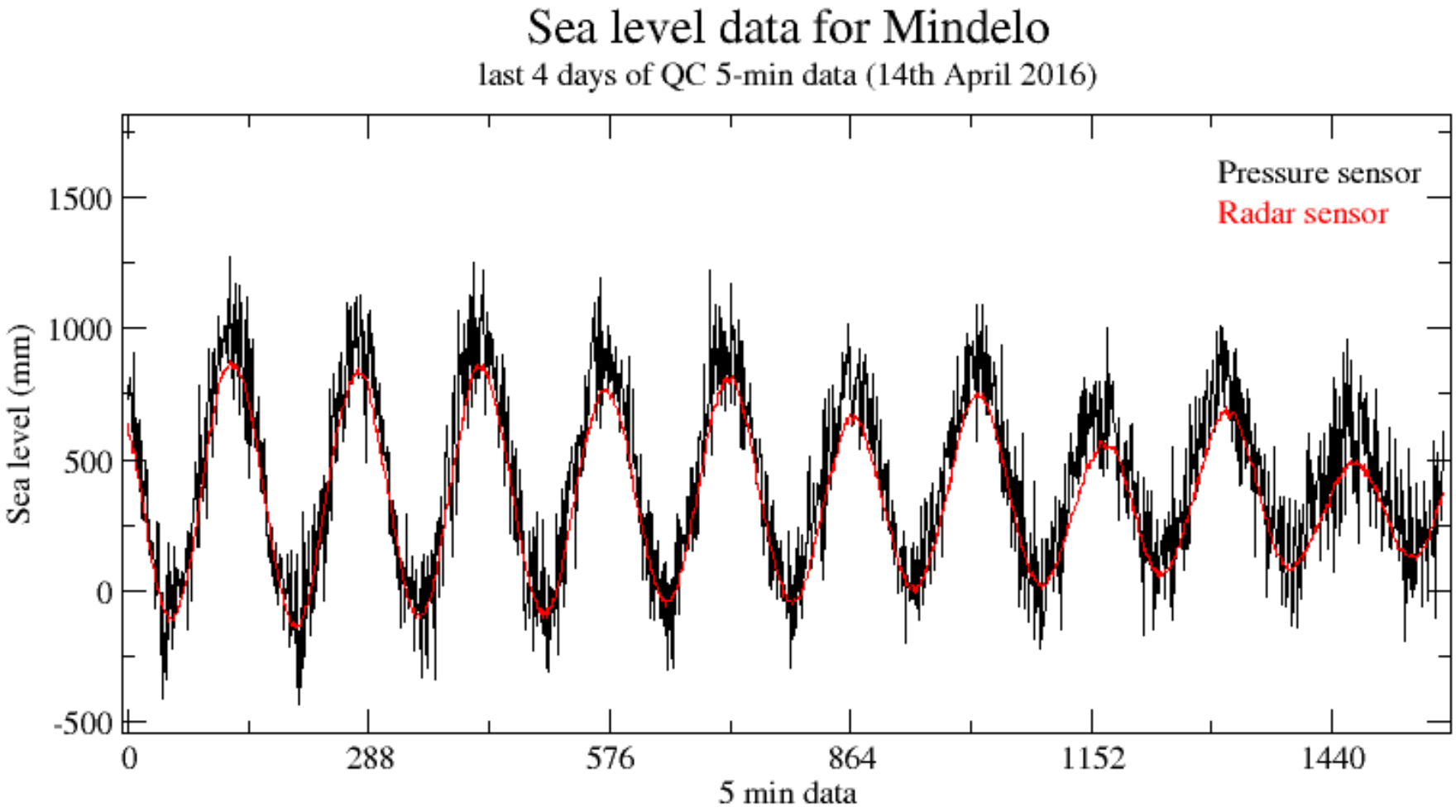
QC Sea Level Data

Recent datum adjustment at Banjul pressure gauge:

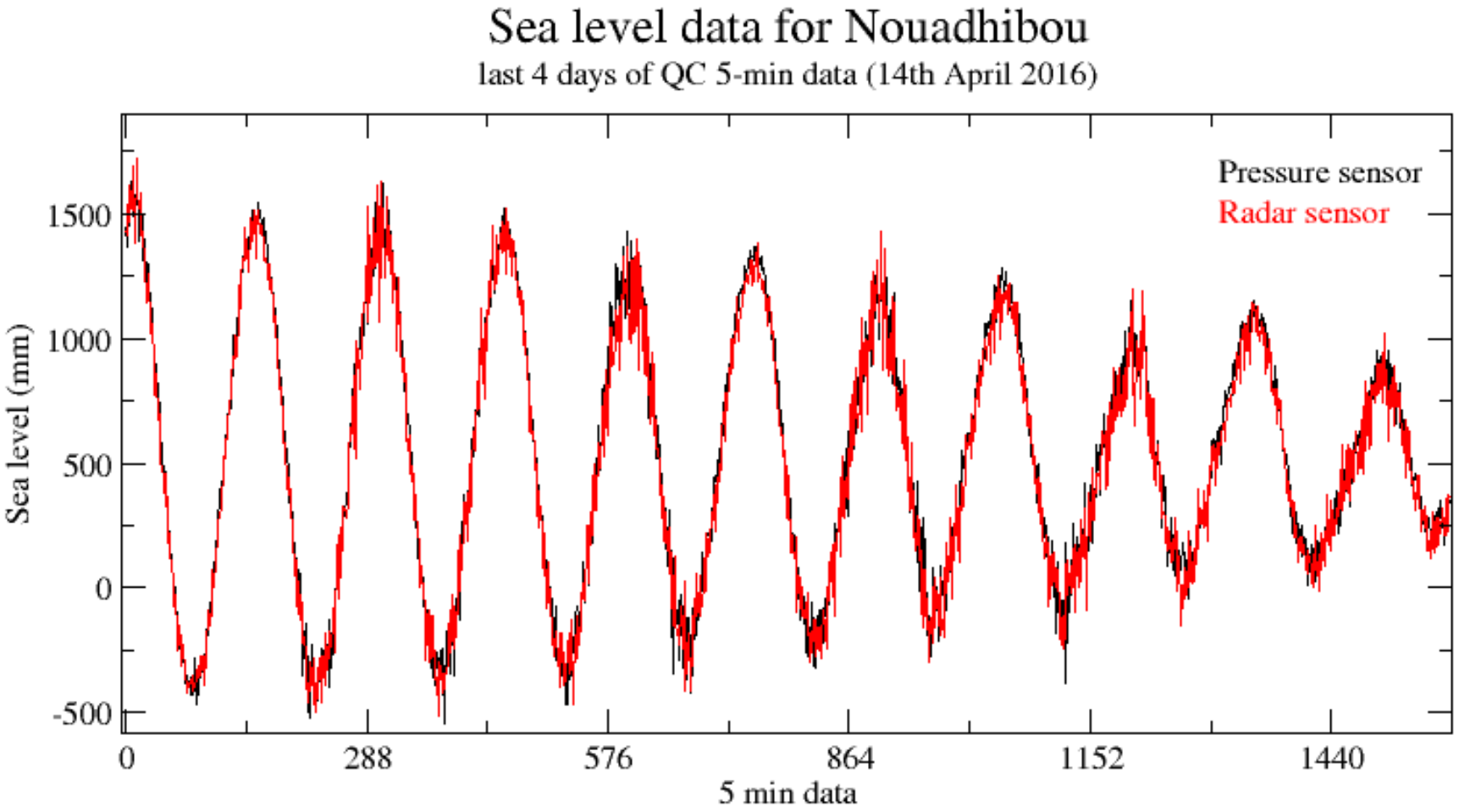


QC Sea Level Data

Concern about different high-frequency variability in Mindelo radar and pressure sensors (average / instant. sampling?



QC Sea Level Data



Questionnaire about the stations

Summary of basic needs according to the national contacts:

- Adequate data visualization and remote data downloading tools
- Training on data quality control and processing, levelling and data transmission for better data exploitation
- New and redundant tool to access data from the national centers (only GPRS now). Funding of communications should be granted
- Relocation of Carabane Miros station and new ones
- Spare parts policy and funding for quick replacement

Enough for a second phase of Marinemet !

Final considerations and summary

- The stations have been installed and are in operation, a great advance and success for oceano-meteorological monitoring in the region

- Several pending issues should be solved within this year or within a new project: data backup and improved access to historical data, redundancy of communications for local contacts (possibility of remote access to data), training on quality control and data processing, data on the GTS, etc

- Proposal prepared with a plan of action for this year and ideas for a second phase of Marinemet (for which funds should be found)


Thank you for your attention..