3rd IHO TIDAL AND WATER LEVEL WORKING GROUP MEETING

05 - 07 APRIL 2011, JEJU ISLAND, REPUBLIC OF KOREA

CHILEAN SEA LEVEL NETWORK

Juan Fierro C.

Lecture Overview

- Current State and ongoing upgrade
- Data transmission
- Sea level station components
- Conclusions

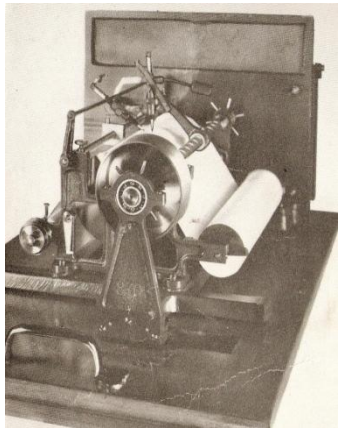
Current State and Ongoing Upgrade

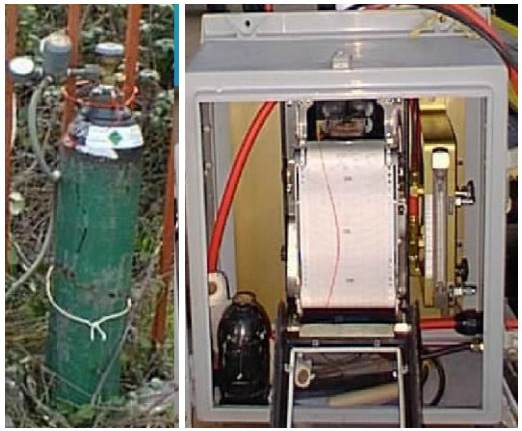
Chilean Sea Level Network Hardware Upgrade process

Feb 27th 2010

1941 — 1970 — 1999 — 2010

Near Real Time | Real Time





dry purged recording tide gauge

Data collecting platforms

A reinforced upgrade

-Improving telemetry

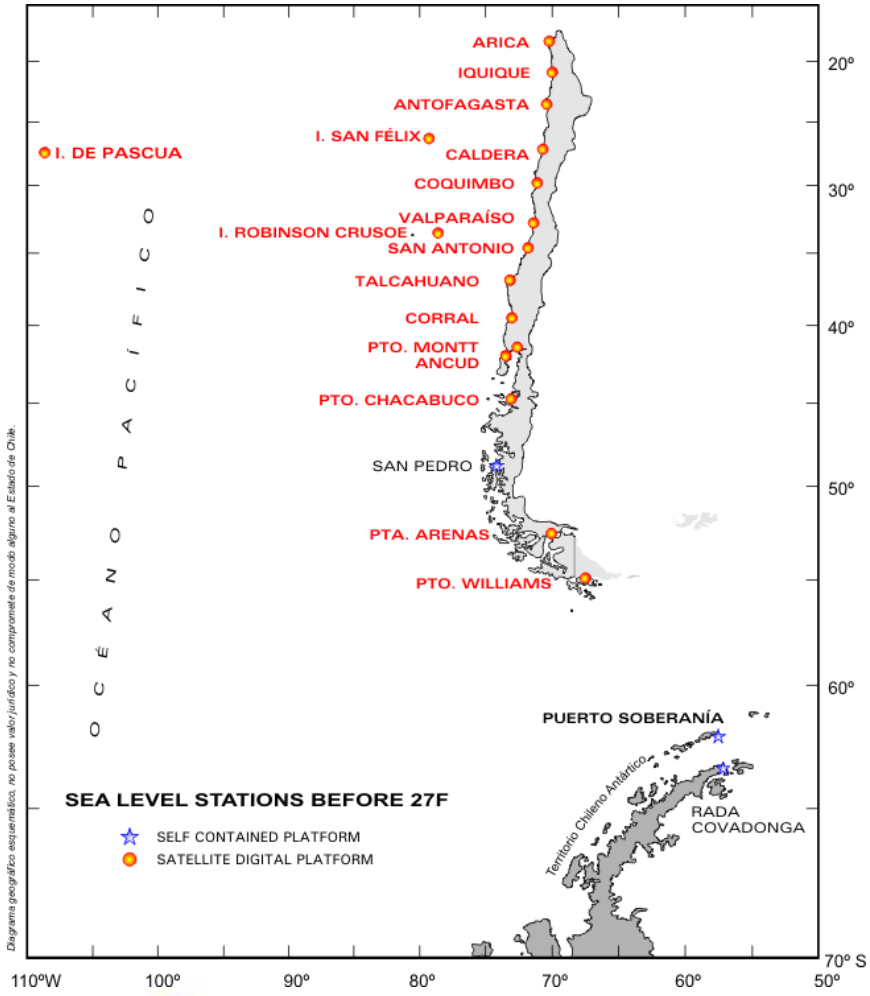
-New platforms and sensors

Mechanical devices

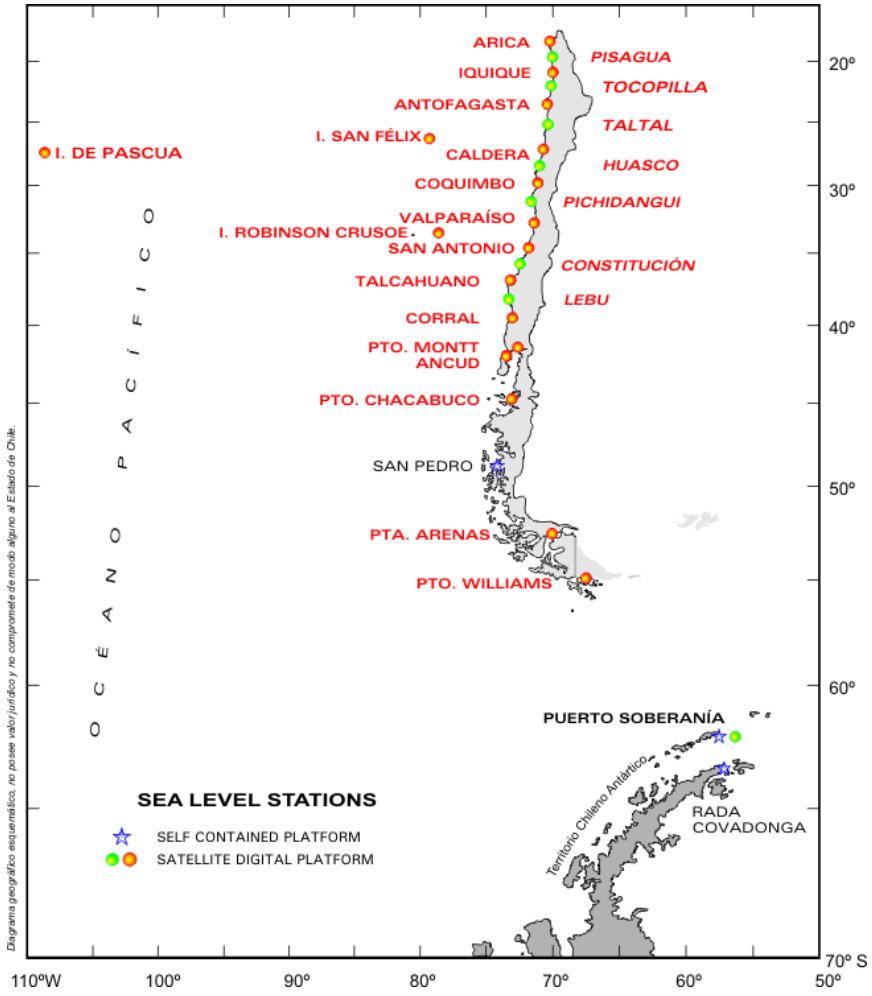
Digital equipments

Chilean Sea Level Stations Network

Before 27 Feb 2010



Updated to Dec 2010



Chilean Sea Level Stations Network

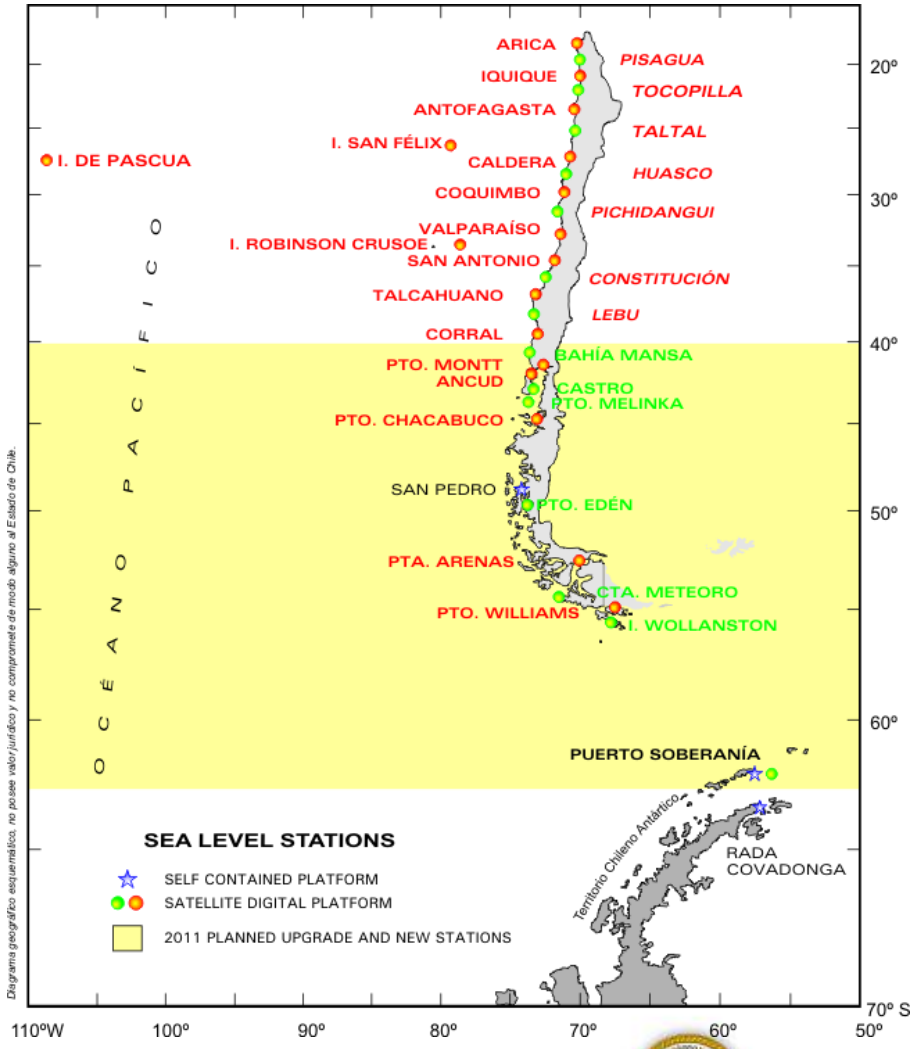
2011 Planned Upgrade and new Stations

- **31 Stations with near real time transmission:**

  Sampling interval: 1 minute
  Tx transmission: 1, 5, 10, 15, 60 min
  Sensor Standard configuration
  Sea Level
  Water Temperature
  Combined Air Temp and humidity
  Atmospheric pressure

- **3 Self contained platforms:**

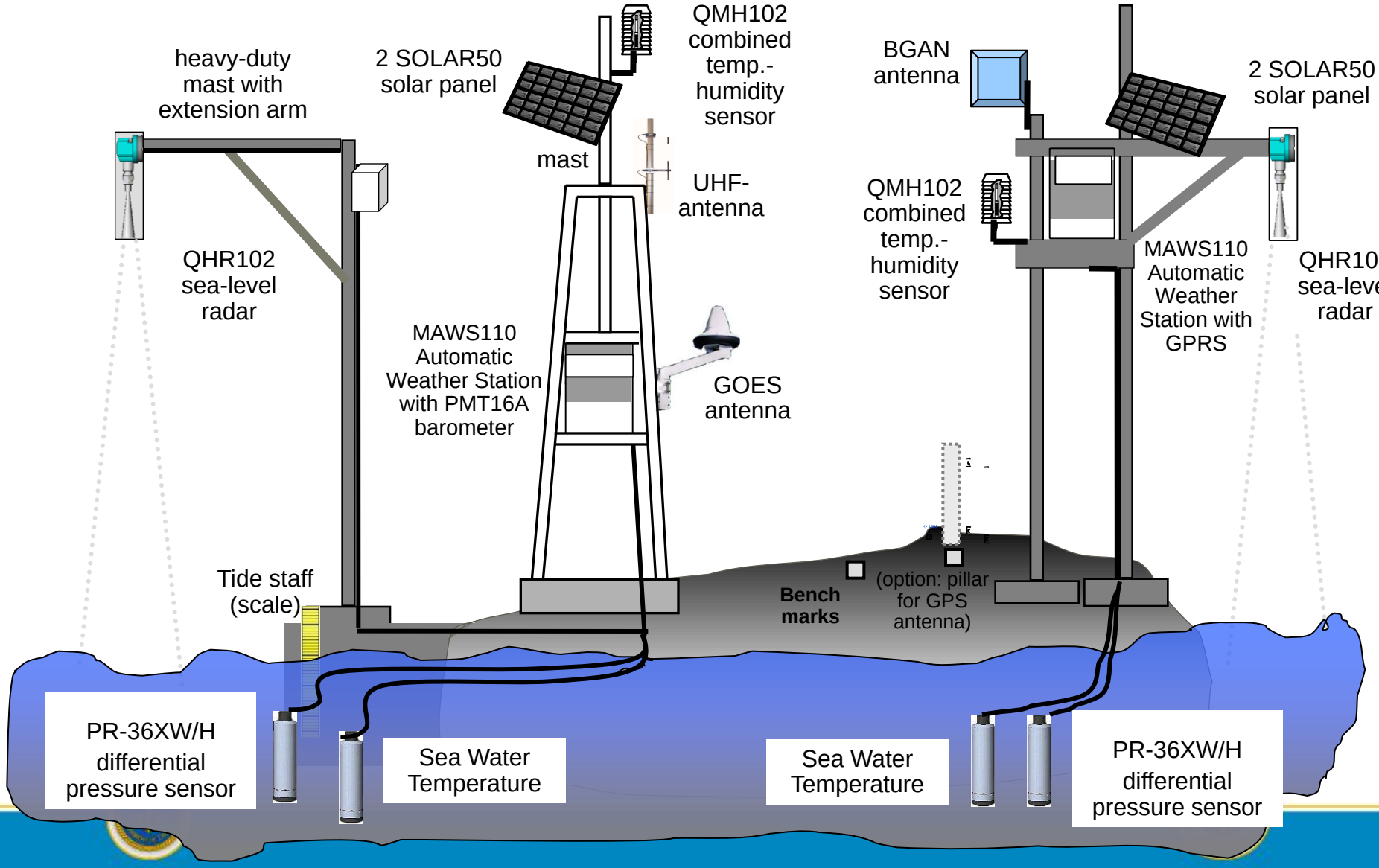
  San Pedro
  Pto. Soberanía (1 year backup)
  Rada Covadonga



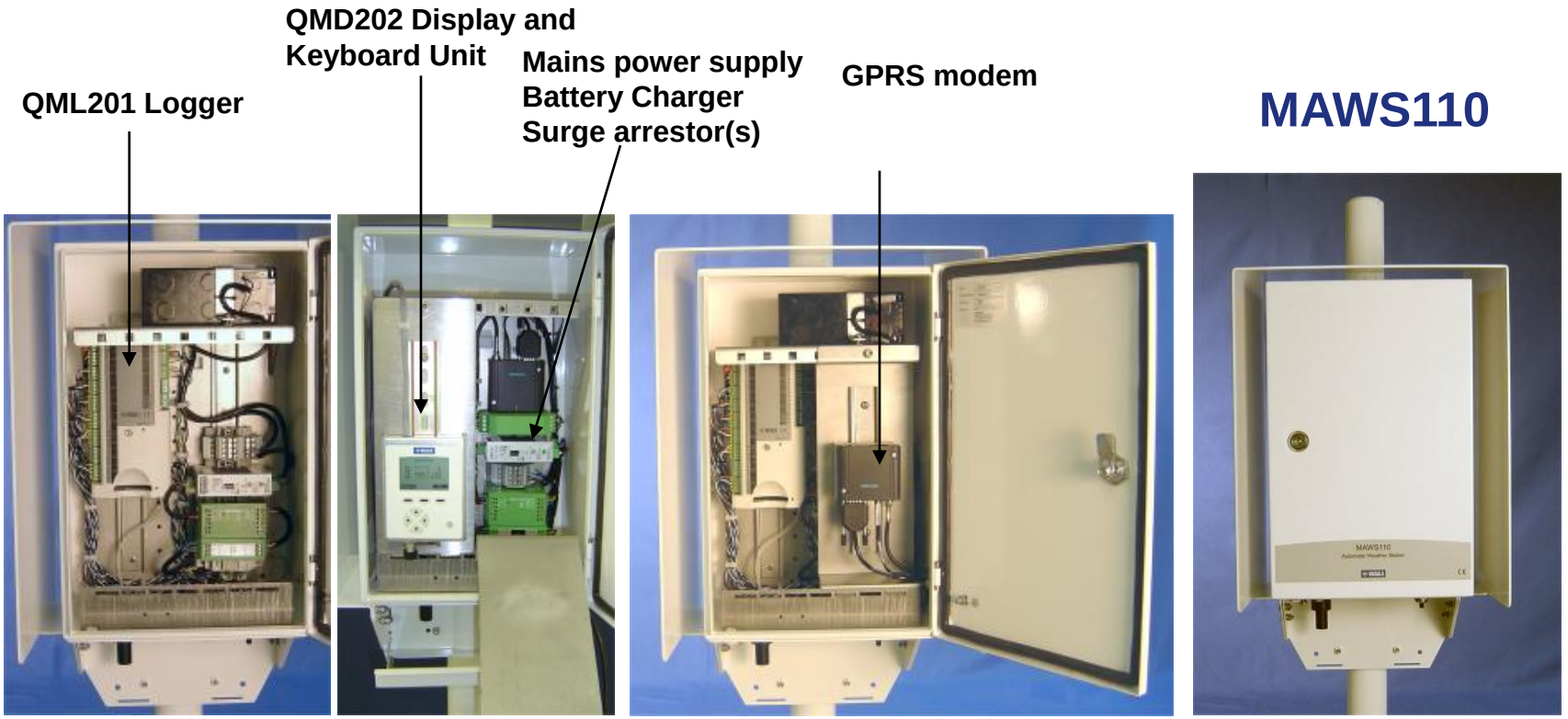
Sea Level Station Components

Tide Station for Tsunami Monitoring

Two Configurations of Installation



VAISALA HydroMet SYSTEM MAWS110
Medium Sized Systems



Submersible Water Level Sensor PR-36XW/H

- **PR-36XW FOR MEASURING HYDROSTATIC LEVEL IN RIVERS, LAKES AND RESERVOIRS**
- **MEASURING RANGE 0 - 40 m (USER SETTABLE)**
- **PR-36XW/H WITH HASTELLOY DIAPHRAGM FOR SEA WATER APPLICATIONS**
- **SPECIFICATIONS:**

OUTPUT SIGNAL:	**4-20 mA, 2-WIRE**
ACCURACY:	**0.1 % of F.S.**
MATERIAL:	**STAINLESS STEEL, POLYURETHANE CABLE**

OPERATING TEMP. : - 40 ° ... +60° C

Radar Water Level Sensor QHR102

- **CONTACT FREE WATER LEVEL MEASUREMENTS(26GHz TECHNOLOGY)**

  - **INSENSITIVE TO MUD, DRIFT WOOD, LEAVES, ETC**
  - **MINIMUM CONSTRUCTION WORK**
  - **INSENSITIVE TO FOG, AIR TEMPERATURE FLUCTUATION**

- **MEASURING RANGE 0 - 35 M**
- **ACCURACY: ± 1 MM**
- **OPERATING TEMP: - 20 TO +70° C**
- **LOW POWER CONSUMPTION**

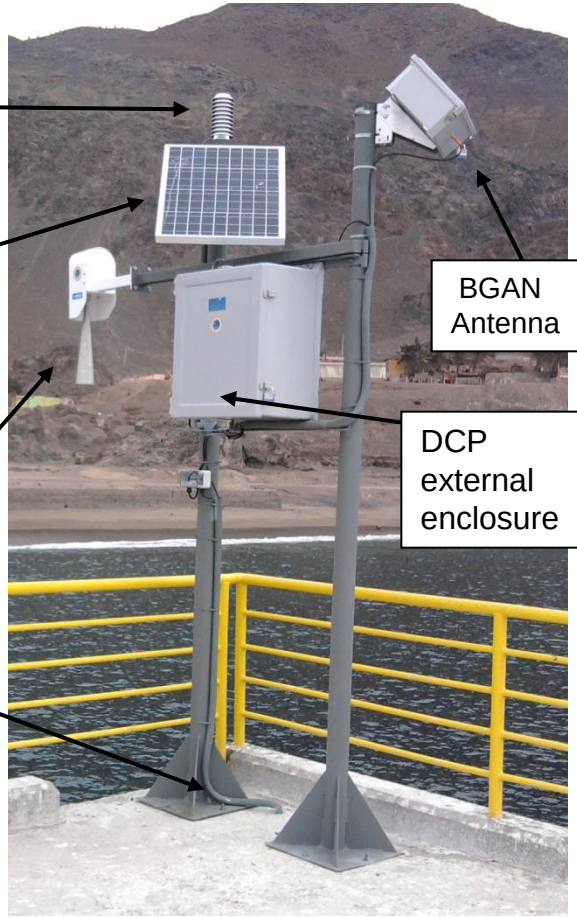
Sea Level Station Components

Mounting Configuration – GOES/Internet Transmission

Pyramid of aluminum

Masts of steel

Sea Level Station Components
BGAN/GPRS Transmission



BGAN Antenna

Thrane&Thrane 300

GPRS Modem

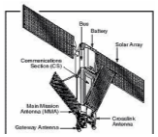
Centurion 300

Data Transmission

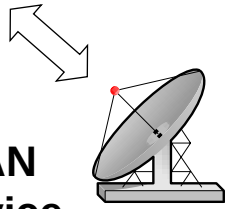
Telemetry Options

- Radio link → Short distances (e.g. harbour operations)
- Virtual Private Network → Countrywide links
- Mobile Phone Link → Long-distance communication
- Mobile Satellite links → Remote areas

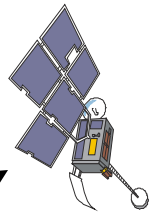
SHOA Operational Data Acquisition



INMARSAT-BGAN

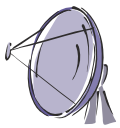


BGAN Service Provider



GOES

BGAN Terminal

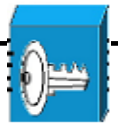


GOES Ground Station

SHOA

Stations in new places

Stations currently installed

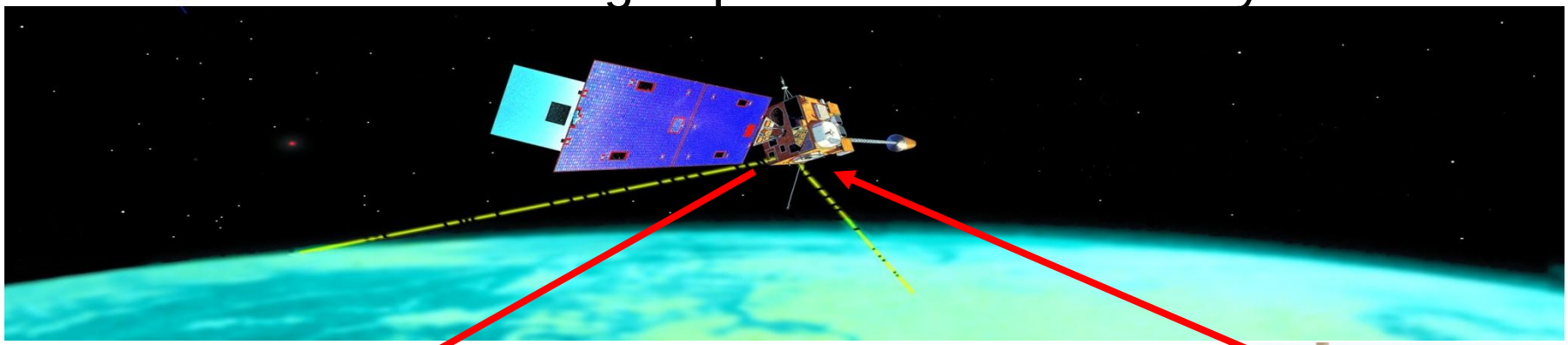


Secure Communication Using Secure navy VPN (backup)

GPRS (backup)

Direct Readout Ground Station (DGRS)

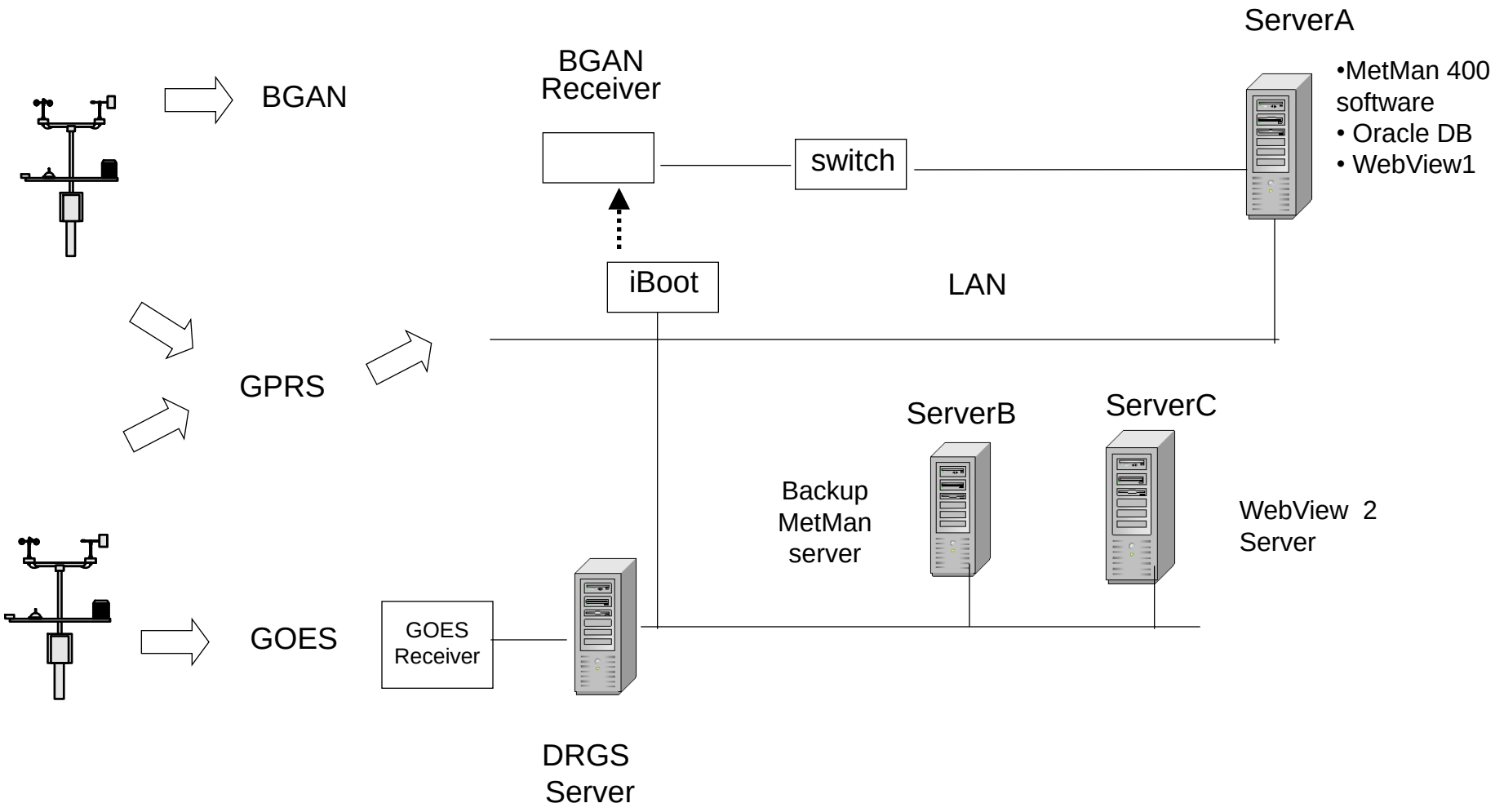
Provides ability to directly receive data from GOES satellites without being dependent on secondary links



Receiver/Demodulator
4 Channel HDR:

- Supports 100 / 300 / 1200 BAUD Transmissions Simultaneously
- Supports auto BAUD detection as recently approved by NESDIS

Data Collection System Components



SHOA Data Center - Servers and Software

- Primary (Metman and WebView I)
- Backup server (Metman and WebView I)
- WebView II server
- Tape back up system
- UPS
- Navy VPN
  - Internet data reception
  - Communication of data to Metman
- DRGS Receiver System
  - GOES data reception
  - Communication of data to Metman
- Network Configuration
- Rooftop BGAN transceiver

SHOA Data Center
Rooftop BGAN transceiver

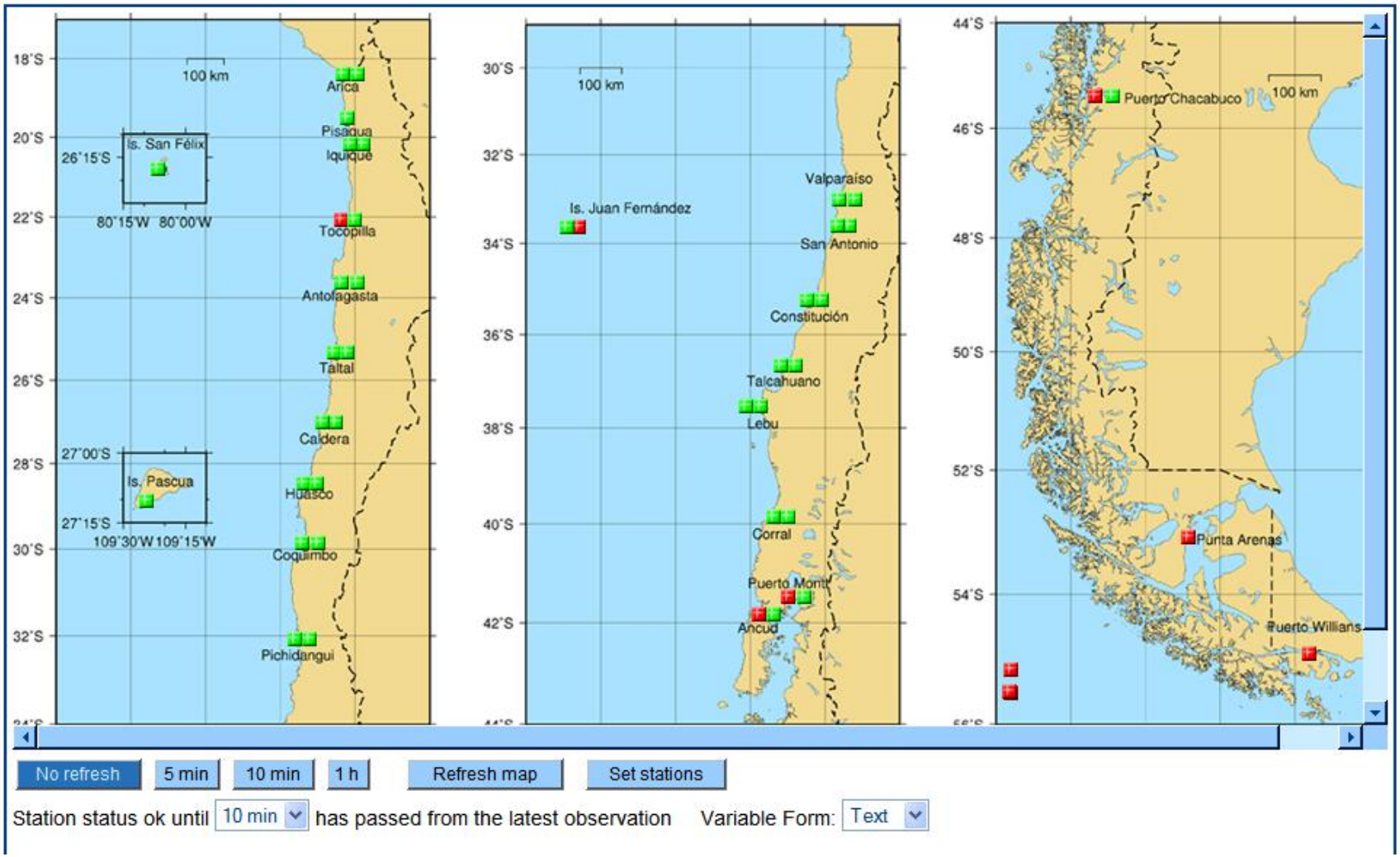
- A Vaisala iBoot module was installed in support of automating BGAN transceiver reset.
  - Periodically, the BGAN transceiver has lost satellite lock and has required a reboot to regain operation.
  - The iBoot along with a Metman script will support recognition of this condition and automatic reboot of the transceiver.

Data Reception

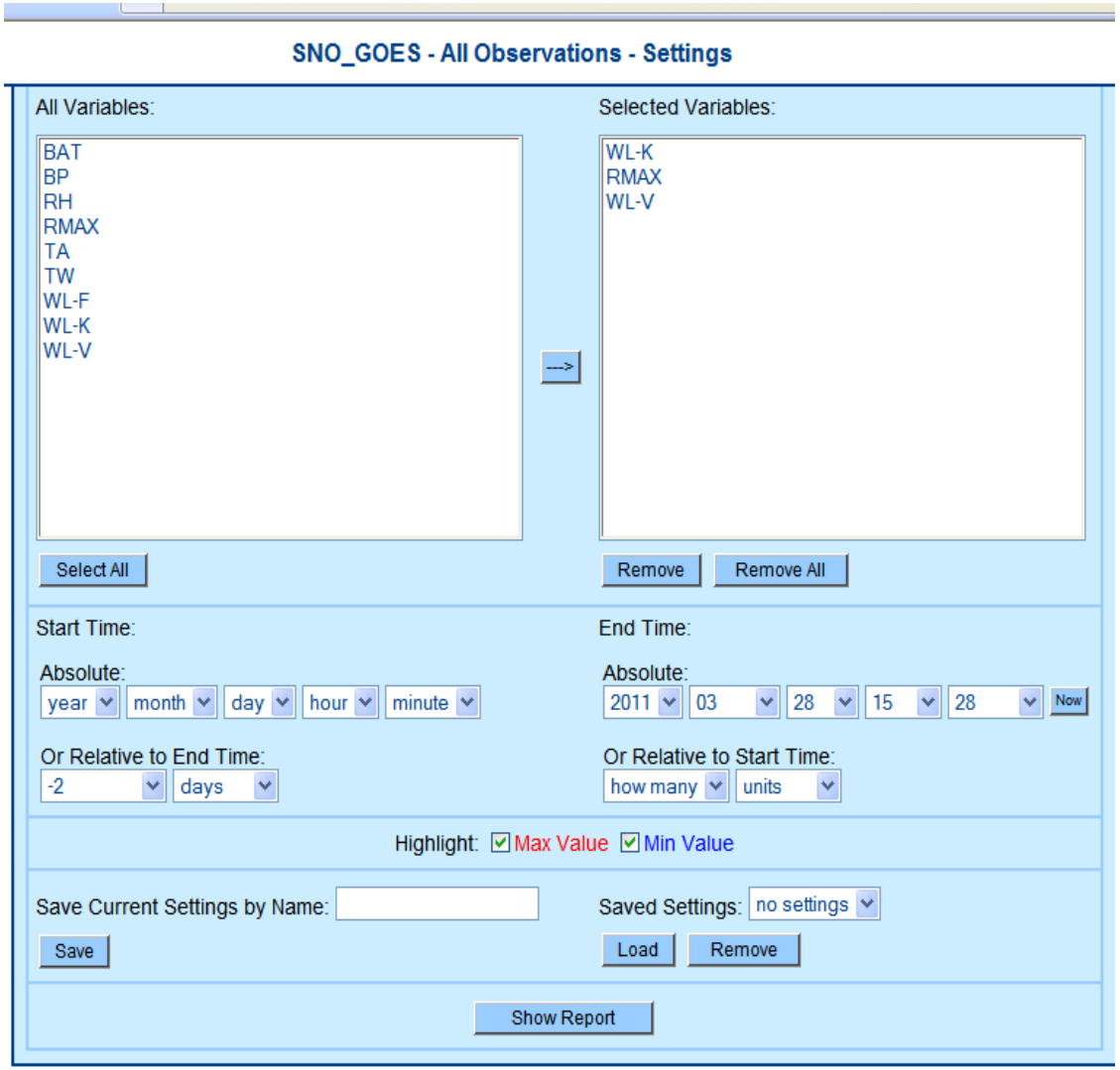
UBS2000

- Software developed by VAISALA
- Collect data from a large number of met and oce sensors
- Displays data in a variety of forms, including graphs, tables, wind roses, status, etc.
- Ingests Data from
  - GOES Direct Readout Ground Station
  - Interrogated Radio
  - Telephone Modem

METMAN – Map Latest Observations



METMAN – All Observations



VAISALA

Back ? Print Choose variables to draw by clicking on tab

Save Report as CSV File by Name: Save

Selected time period: 2011-03-26 15:28:00 - 2011-03-28 15

Date & Time	WL-K (mm)	RMAX	WL-V (mm)
2011-03-26 15:28:00	2609	11.0	4593
2011-03-26 15:29:00	2625	11.0	4561
2011-03-26 15:30:00	2669	11.0	4585
2011-03-26 15:31:00	2757	11.0	4575
2011-03-26 15:32:00	2663	19.0	4600
2011-03-26 15:33:00	2614	19.0	4525
2011-03-26 15:34:00	2661	19.0	4540
2011-03-26 15:35:00	2580	19.0	4562
2011-03-26 15:36:00	2547	19.0	4534
2011-03-26 15:37:00	2666	23.0	4602
2011-03-26 15:38:00	2630	23.0	4592
2011-03-26 15:39:00	2609	23.0	4547

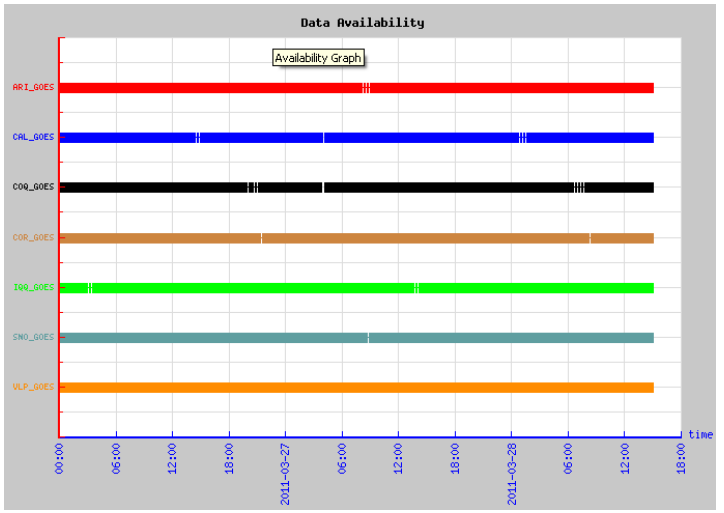
Current GOES and Internet VPN Status

VAISALA Dat

Back ? Print Draw Availability 1 Draw Availability 2

Selected time period: 2011-03-26 00:00:00 - 2011-03-28 15:07:47, Reference variable: V

Station	2011-03-26		2011-03-27		2011-03-28 !		Sum	Average
ARI_GOES	1425	99 %	1404	98 %	895	99 %	3724	98 %
CAL_GOES	1397	97 %	1426	99 %	863	95 %	3686	97 %
COQ_GOES	1394	97 %	1415	98 %	839	93 %	3648	96 %
COR_GOES	1408	98 %	1430	99 %	879	97 %	3717	98 %
IQQ_GOES	1389	96 %	1399	97 %	900	99 %	3688	98 %
SNO_GOES	1430	99 %	1414	98 %	895	99 %	3739	99 %
VLP_GOES	1424	99 %	1434	100 %	890	98 %	3748	99 %
Sum/Average	9867	98 %	9922	98 %	6161	97 %	25950	98 %

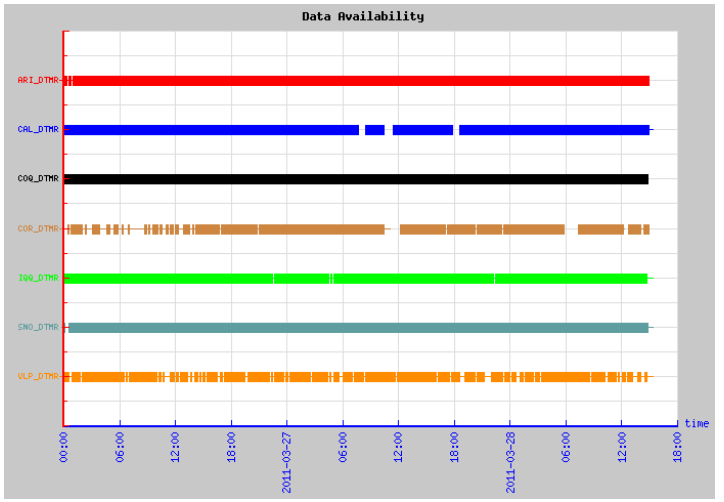


VAISALA Data

Back ? Print Draw Availability 1 Draw Availability 2

Selected time period: 2011-03-26 00:00:00 - 2011-03-28 14:59:28, Reference variable: W

Station	2011-03-26		2011-03-27		2011-03-28 !		Sum	Average
ARI_DTMR	1424	99 %	1439	100 %	888	99 %	3751	99 %
CAL_DTMR	1440	100 %	1290	90 %	887	99 %	3617	96 %
COQ_DTMR	1429	99 %	1439	100 %	889	99 %	3757	99 %
COR_DTMR	1072	74 %	1244	86 %	709	79 %	3025	80 %
IQQ_DTMR	1331	92 %	1326	92 %	833	93 %	3490	92 %
SNO_DTMR	1431	99 %	1439	100 %	888	99 %	3758	99 %
VLP_DTMR	1153	80 %	1163	81 %	714	79 %	3030	80 %
Sum/Average	9280	92 %	9340	93 %	5808	92 %	24428	92 %



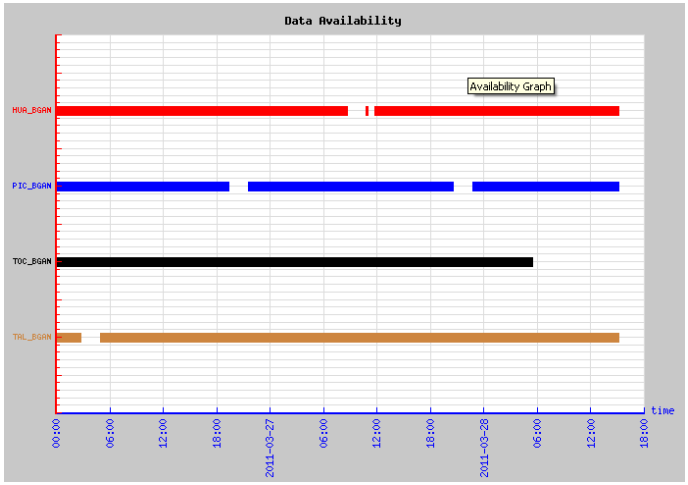
Current BGAN and GPRS Status

VAISALA

Back ? Print Draw Availability 1 Draw Availability 2

Selected time period: 2011-03-26 00:00:00 - 2011-03-28 15:15:27, Reference variable: WL

Station	2011-03-26		2011-03-27		2011-03-28 !		Sum	Average
HUA_BGAN	1427	99 %	1274	88 %	900	98 %	3601	95 %
PIC_BGAN	1289	90 %	1294	90 %	903	99 %	3486	93 %
TOC_BGAN	1433	100 %	1428	99 %	321	35 %	3182	78 %
TAL_BGAN	1300	90 %	1428	99 %	900	98 %	3628	96 %
Sum/Average	5449	95 %	5424	94 %	3024	83 %	13897	90 %

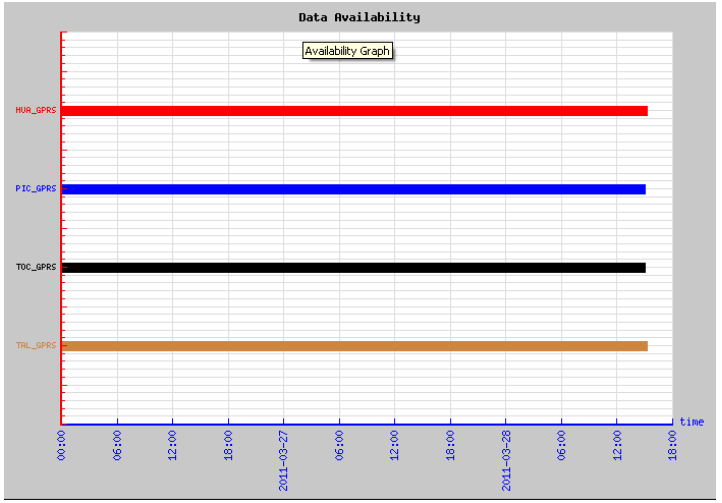


VAISALA

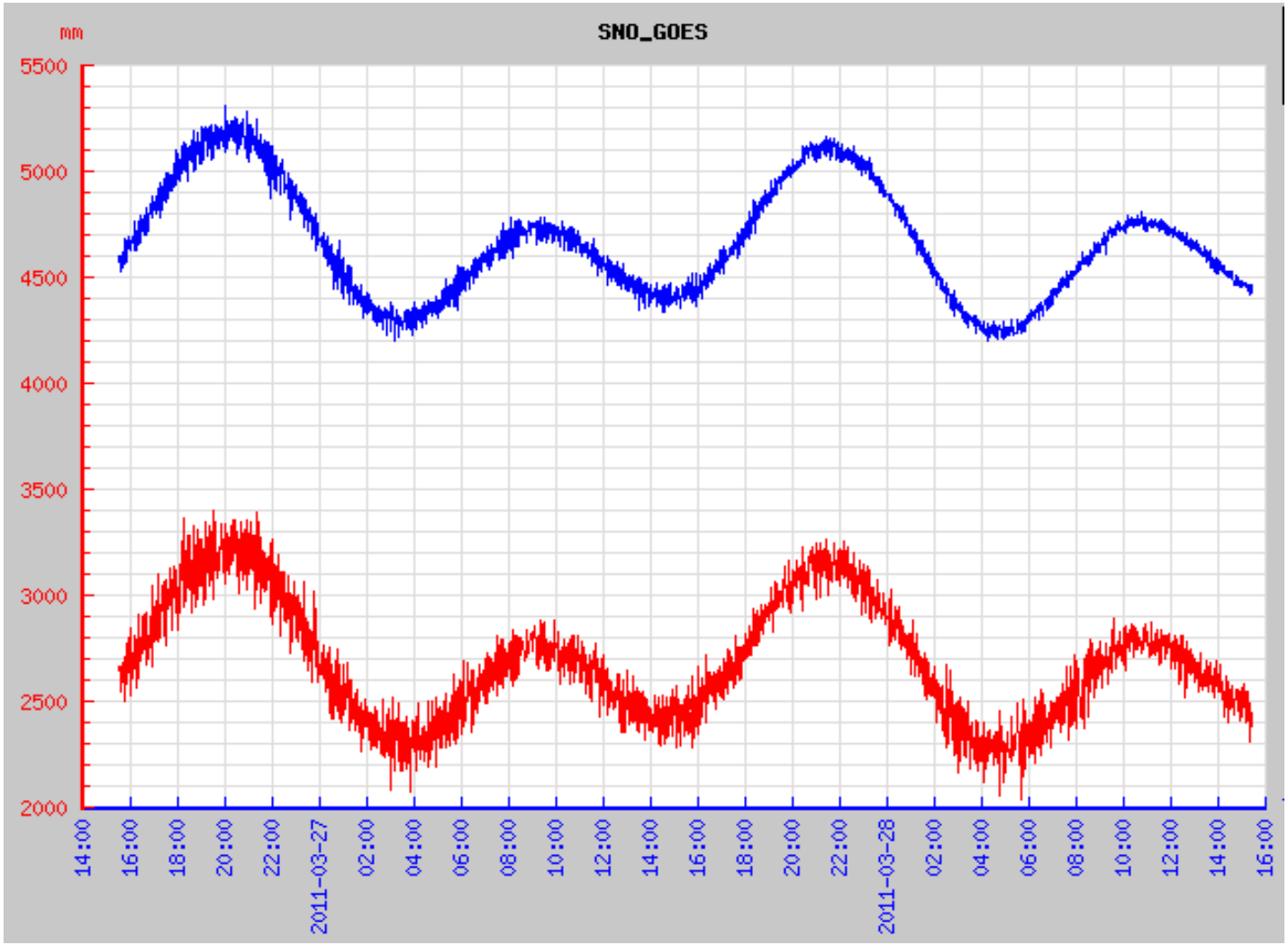
Back ? Print Draw Availability 1 Draw Availability 2

Selected time period: 2011-03-26 00:00:00 - 2011-03-28 15:18:35, Reference variable: W

Station	2011-03-26		2011-03-27		2011-03-28 !		Sum	Average
HUA_GPRS	1440	100 %	1440	100 %	906	99 %	3786	100 %
PIC_GPRS	1440	100 %	1440	100 %	906	99 %	3786	100 %
TOC_GPRS	1440	100 %	1435	100 %	906	99 %	3781	99 %
TAL_GPRS	1440	100 %	1440	100 %	916	100 %	3796	100 %
Sum/Average	5760	100 %	5755	100 %	3634	99 %	15149	100 %



METMAN – Sea Level Graphs

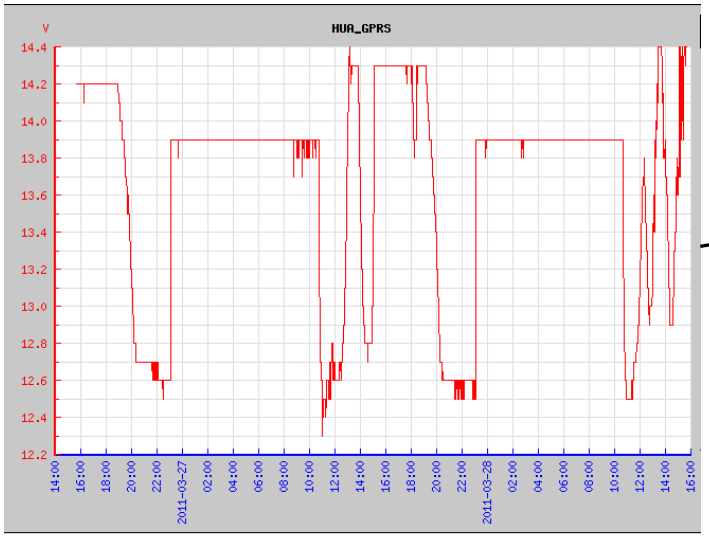


Radar

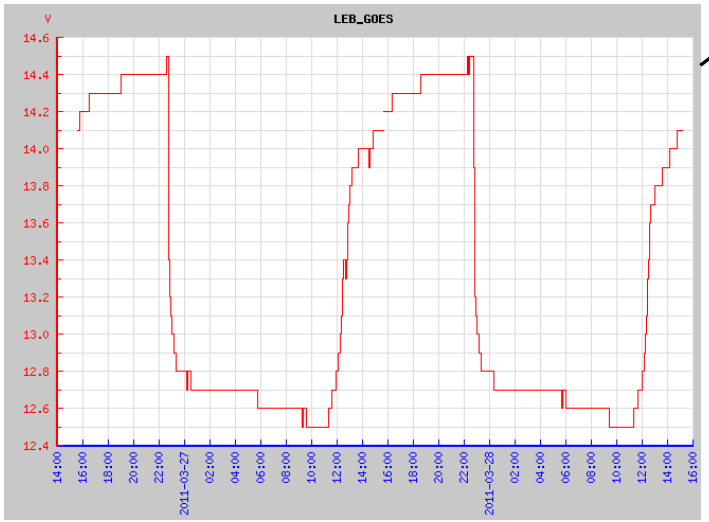
Pressure

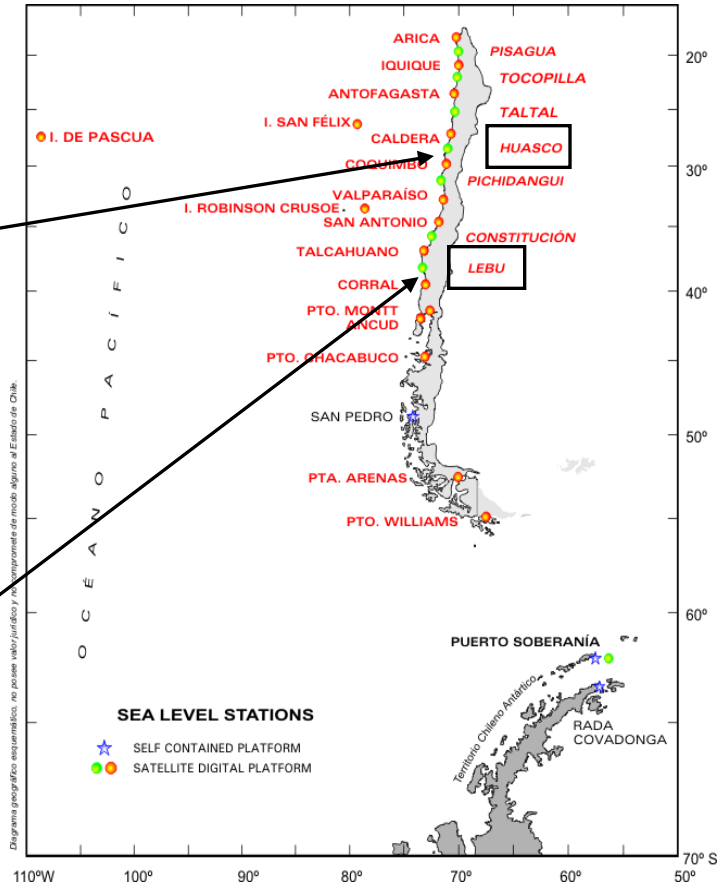
Power Supply

Main Electrical power available only at night



Without continuous main electrical power





SHOA – Sea Level Data Reception Centre

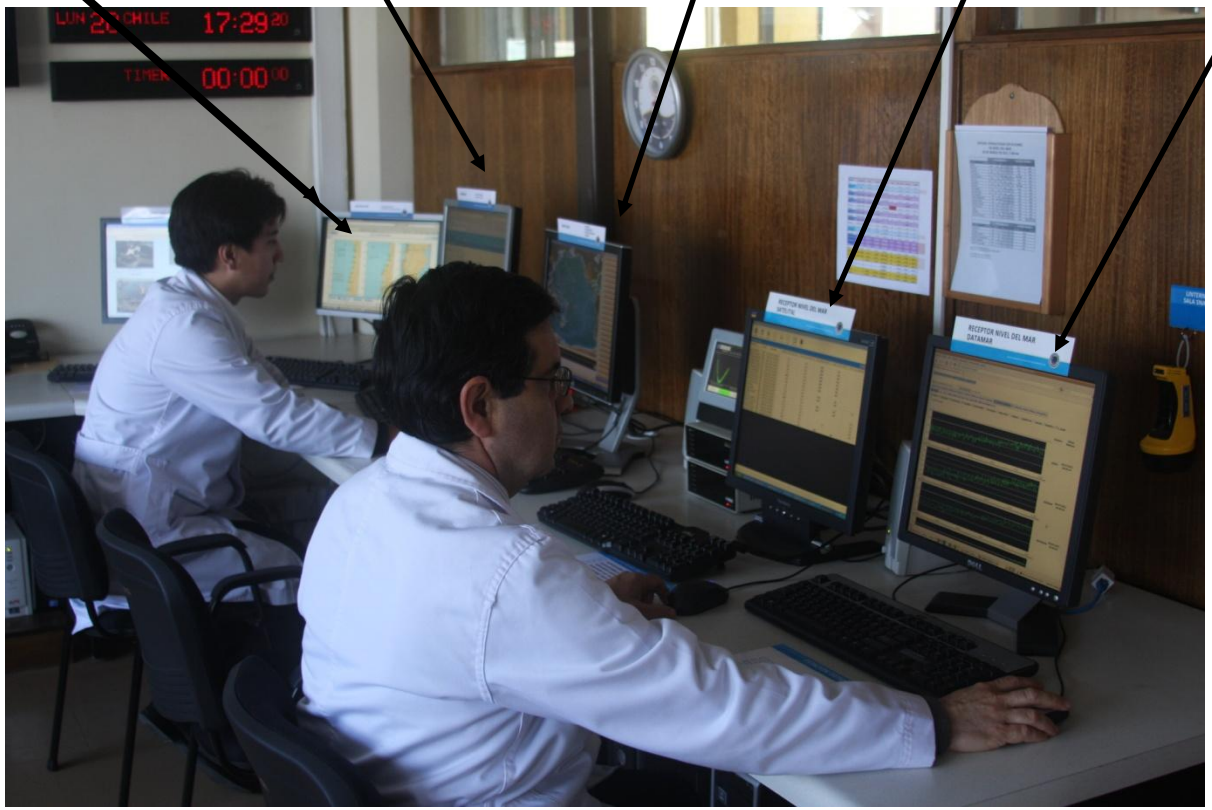
METMAN I

METMAN II

TIDE TOOLS

DRGS

Navy VPN



Conclusions

- Alternative systems for real time data transmission using several telemetry options (GOES, BGAN, GPRS and a Wide Area Network) has given powerful support to the National Tsunami Alarm System operation.

- VEGA radar sensor has demostrate high reliability in several sea conditions as a redundant sea level sensor (potencially primary sensor).

- SHOA is recognized as a leader in the use of remote data collection systems.

- Densification has improved the sea level data collecting network for operational and scientific purposes.

THANKS