MARINA DE GUERRA DEL PERÚ

4 Meeting of the IHO Tidal and Water Level Working Group – TWLWG3

Cape Town, South Africa, 8 - 10 May 2012

"National Tidal Issues Peruvian Sea Level Network"

Second Lieutenant Enrique Varea

Contents

- Genral Information
- Tide Gauges
- We Used Tides For
- Our Future
- Review of Action Items TWLWG3 and IHO Resolutions

General Information

More than 3,000 km of coast.

Iregular y different topography.

Many tide amplituds along the coast

Important recurrent events, mainly ENZO.

Tide Gauge

Automatic Stations 2001

10 SUTRON sensor
Send data hourly

Automatic Stations 2010

10 Radar Sensors
Send data in real time

The Future…

- Install a GVAR station to intregate an standar network for tide gauges and meteorogical information (this year)
- Extend our tide network with 17 new stations (2012- 2015)

Tsunami warning system

National Network

We used for

- Vertical Datums
- Correct chart soundings, Tide streams
- Lunar phases realtionships.
- Navigation, acuatic sports, port activities safety, also to alert in case of Tsunamis or important sea changes.
- Study harmonics to make anual predictions and information for numeric models (sediment transport, currents).

We used for

- Make statiscts of anomaluos waves, this information is commercialized and used in our Hydrgraphic Service to make sea predictions.

- Cientific investigations like:
  - ENZO
  - Register to determine the Tsunami timeline.
  - Register sea perturbations and seiches,
  - Sea level variation related to earthquakes
  - Climate changes.

Our Future

- Redundancy sensors in tide stations (pressure sensors and radar sensors)
- Work with 17 tide automatic stations
- Use DRGS.

Review Action Items TWLWG3 and IHO Resolutions

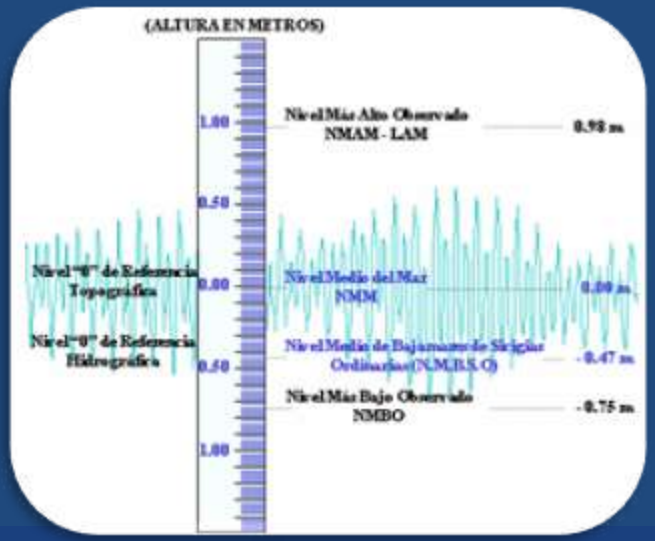
2 Datums and Bench Marks

The Datums are based in data collected in a lunar cicle (19 years)

Each six months we make bench mark nivelations in all our tide stations

Principal Datums:

- Mean Sea Level
- Mean low water springs is used in our Hydrographic Service for chart datums (all scales) and tide predictions
- River and estuaries datum does'nt have clear standards.



Review Action Items TWLWG3 and IHO Resolutions

3 Harmonics

Basic information wich should include: tide station name, code, country, timezone, source, date, datum, list of components, kind of sensor and responsable

Símbolo	Amplitud (cm)	Fase (°)	Símbolo	Amplitud (cm)	Fase (°)
Semidiurnas			BET_1	0.1802	232.78
M_2	23.5878	213.91	CHI_1	0.1388	58.53
S_2	8.0014	184.05	UPS_1	0.1261	304.77
N_2	6.4016	166.90	$2Q_1$	0.1272	202.64
K_2	2.5371	326.60	PSI_1	0.1212	37.78
Mu2	1.3142	232.3	ALP_1	0.0906	205.70
Nu2	1.1720	254.37	*De periodo largo*		
2N2	0.8752	111.00	S_a	11.5554	243.04
L2	0.7509	17.23	Ssa	3.9331	115.94
EPS2	0.4848	167.34	M_f	1.5148	122.49
H2	0.3832	318.56	Mm	1.2273	113.35
T2	0.3740	349.09	MS_f	1.1744	144.22
LDA2	0.2595	329.73	MS_m	0.9571	66.45
ETA2	0.2406	11.43	*Componentes armónicos de mareas en aguas superficiales (efecto local)*		
MSN2	0.2014	34.58	M_3	0.6187	258.02
MKS2	0.1547	110.98	S_4	0.2812	118.58
OQ2	0.1541	95.78	SK3	0.2599	285.69
R2	0.0625	309.94	2MS6	0.2492	179.10
Diurnas			2MK6	0.1749	337.21
K1	15.0296	114.50	SO3	0.1488	151.68
O1	7.1453	161.40	MK4	0.1376	329.81
P1	4.4837	140.13	M6	0.1271	179.53
Q1	1.0874	110.16	MO3	0.1301	131.85
J1	0.9759	158.63	MK3	0.1202	38.42
NO1	0.9143	70.43	2MK5	0.1040	264.76

4 Prediction tide table

Our Digital Tide table is been made, (finished this year).

The “digital tide table” for Peruvian ports is an anual publication since 1946, actually we have predictions for 22 ports in Peru.

Review Action Items TWLWG3 and IHO Resolutions

5 Tide data exchange

- We are the only institution in Peru witch collects tide data.
- We share data and other information with another WG (GLOSS, PSMSL, JASL-UHSLC) and countries
- We are interested in share and recieve tide information use all channels (mail, internet, ftp)

6 World tide observation network

- Tide data should be one of the most reliable source in the world, the storage to conserve it would be used in many cases, like navigation and science.
- Is very important to make efforts for extend the tide data all over the world
- We recongnize and value the instalation of three Tide stations in peru by the University of Hawaii.

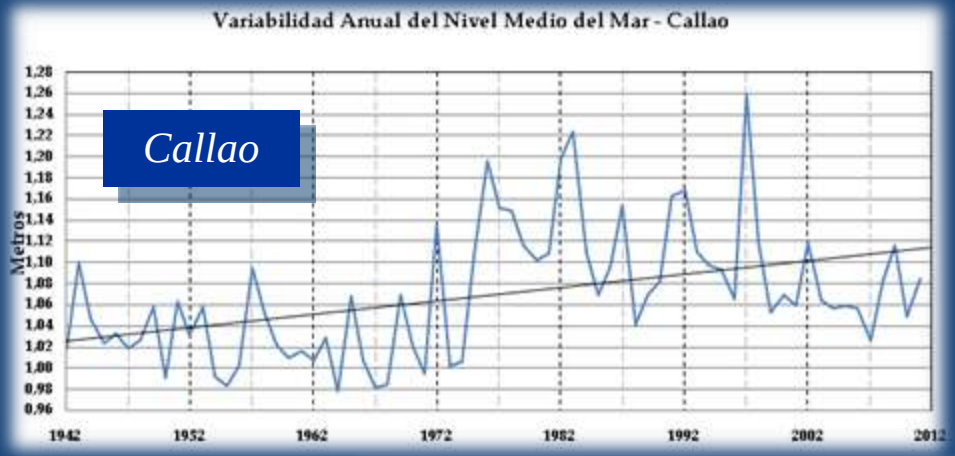
Review of Action Items TWLWG3 and IHO Resolutions

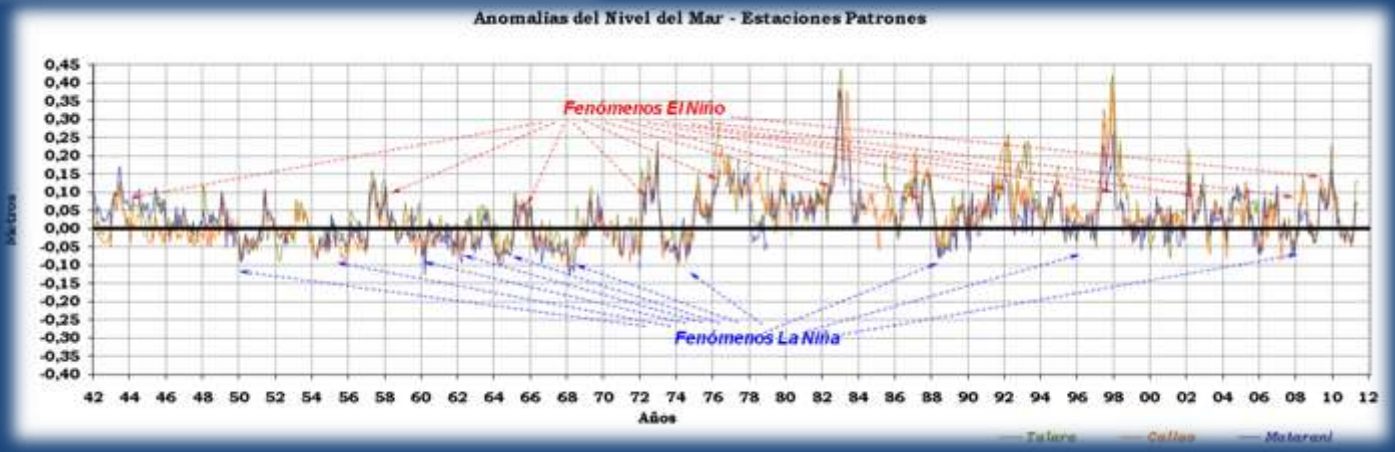
7 Global Sea Level Rise

- The sea level rise produces many negative consecuences like floods, coast variation, lost buildings, ecologic damages and more.
- It's neccesary to obtain data from long periods (40-60 years) witch could be able to determinate the sea level rise in a timeline
- Long periods tide data provides more reliable global numeric models related with climates, to make better predictions and take decitions to mitigate them.
- We determine, based in data about 69 years ago, a sea level rise, faster at ENZO event. Now we saw a rise of 10 cm in these 69 years.
- However, we recommend tu use GPS to see differences between vertical movements and sea level changes.

Review of Action Items TWLWG3 and IHO Resolutions

7 Global Sea Level Rise





Review of Action Items TWLWG3 and IHO Resolutions

8 Tsunami Alerts

- To imporve our Tsiunami warning center, we've installed 10 tide stations with radar sensors witch transmit data in live. they also have a camera to see changes in waves. Moreover we are planning to install 6 more this year.

- Related to tide network, we make a solicitude from NOAA to opbtain High Frecuency Channels, to trnsmit regional data in live via GOES.

Conclusions

- It's prioritary to have long period tide data mainly for climate change investigations.

- Tide stations must have two sensors workin in parallel to compare data, witch makes more reliable the Infomation about Tsunamis.

- New Technology in tide gauges makes benefits in time and money. Also gives more precition in data.

- It's very important to consider courses or seminaries about tides, in our case we need knowledges related with tidal streams.

- We reccomend to consider more standards about vertical datums for rivers and estuaries

Thanks!