AIOM

ASSOCIAZIONE DI INGEGNERIA OFFSHORE E MARINA

STUDI DI AGGIORNAMENTO SULL'INGEGNERIA OFF-SHORE E MARINA

"Nuove tecnologie, Nuove applicazioni, Nuove normative"

ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI SALERNO

ATENA ASSOCIAZIONE ITALIANA DI TECNICA NAVALE Sezione Napoli – Sud Italia

28 e 29 novembre 2016

Università degli Studi di Salerno

Ordine degli Ingegneri di Salerno

Ordine dei Geologi della Campania

ORDINE DEI GEOLOGI DELLA CAMPANIA

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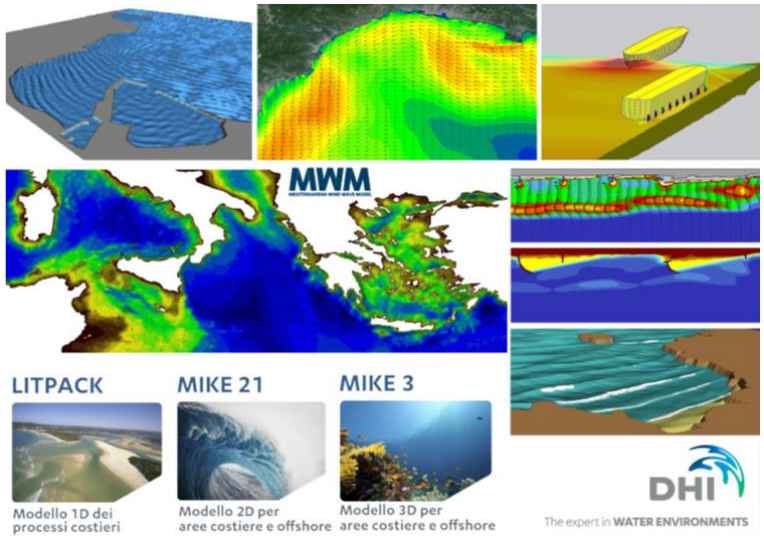
EnvirTech



CON IL PATROCINIO DI:

REGIONE CAMPANIA

COMUNE DI SALERNO

Provincia di SALERNO
www.provincia.salerno.it

AUTORITÀ PORTUALE SALERNO

CON I RINGRAZIAMENTI A:

GUARDIA COSTIERA

AIOM - SALERNO - OCT 2016

Innovazione nelle misure ondametriche in sito

AIOM 2016 Salerno 28 e 29 Ottobre 2016
AIOM In collaborazione con ATENA SUD
STUDI DI AGGIORNAMENTO SULL'INGEGNERIA OFF-SHORE E MARINA

Ordine degli Ingegneri di Salerno- Ordine dei Geologi

ENVIRTECH

A group of private companies established in 2000,

Meteorology, Oceanography,

Environment, Marine surveillance,

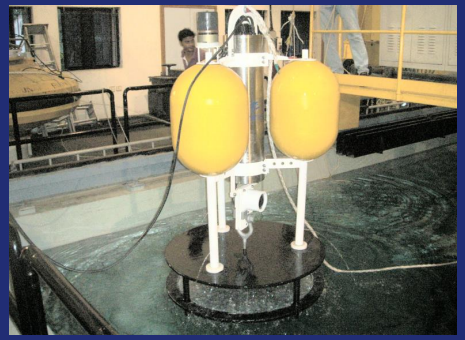
Maritime Security

* * *

Italian, Turkish and Chinese Data Buoy Network

Thai, China, India Tsunami Warning System

Products - Marine and deep sea



Products - Marine and deep sea

Data Buoys:

MKI-3	Directional wave and general purpose buoy
MKIII	Spar buoy - relay buoy
MKIV	3Metre buoy - Coastal buoy
MKVI	Surveillance buoy and Multistatic sonar node
MKVII	Directional wave mini buoy (50cm)

Benthic stations

Vulcan Class sea bottom laboratory

Poseidon Class Tsunameters

Calypso Class Tsunameters

Leading projects

Palermo 2005

Vulcan Class

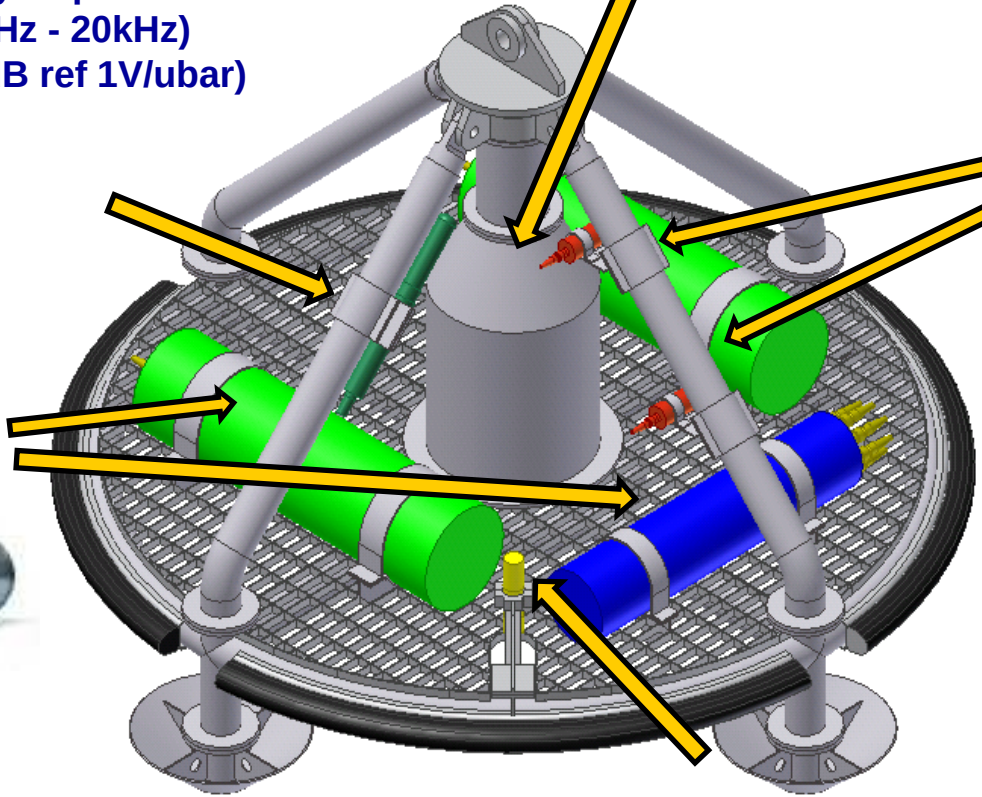
Preliminary test

Hydrophone
(0Hz - 20kHz)
(-92 dB ref 1V/ubar)

Seismometer
Housing

2 x Pressure sensors
(7000 m full scale)
(1mm accuracy)

Titanium Vessels
(6000 mwd)

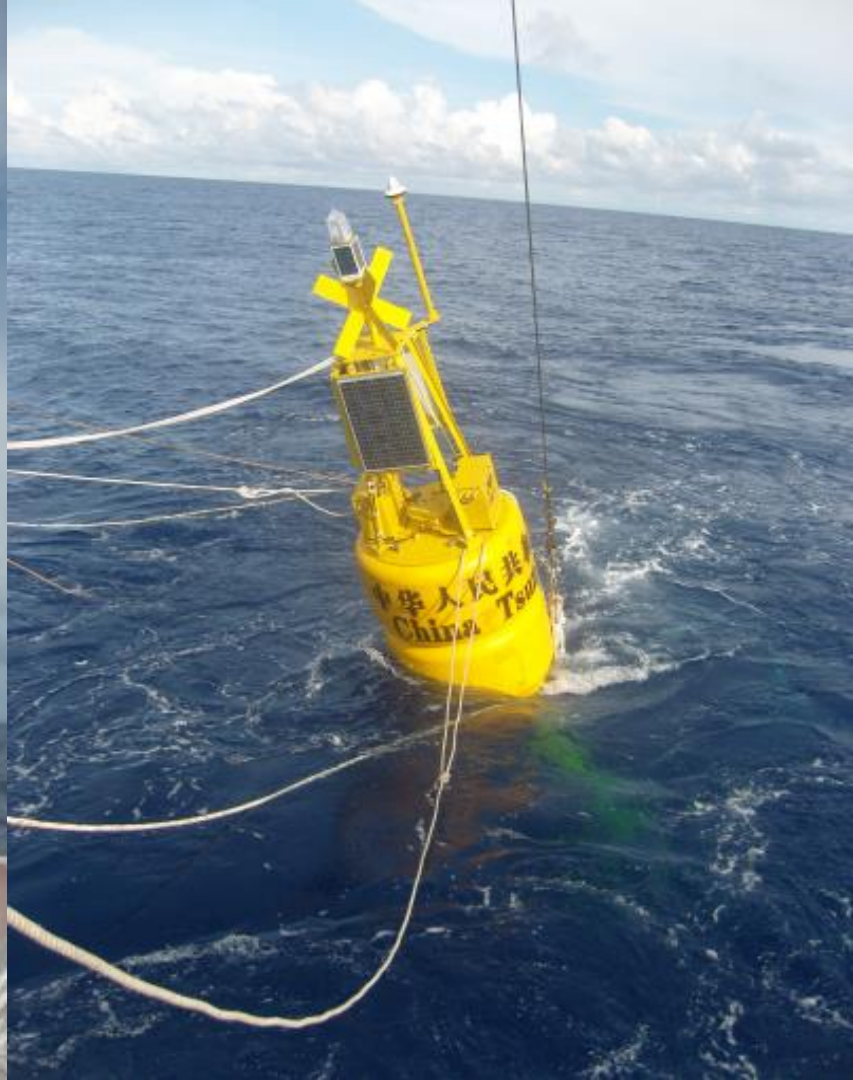


Altimeter (0.3 - 50m)

SOA 2010

ADCP

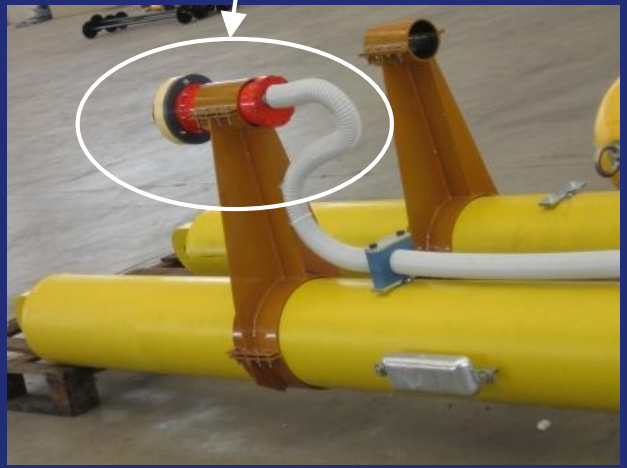
South China Sea



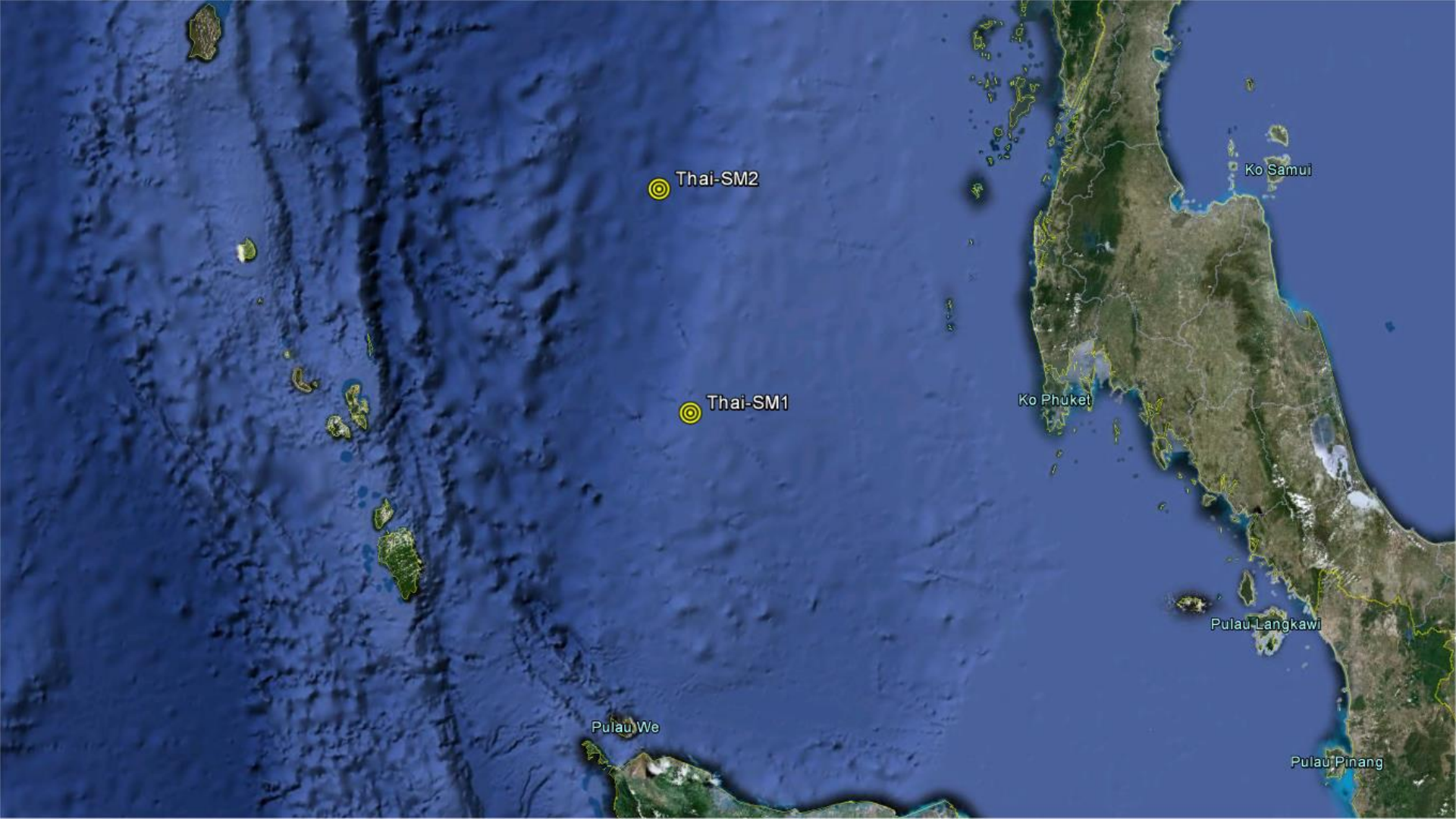
Thailand 2011

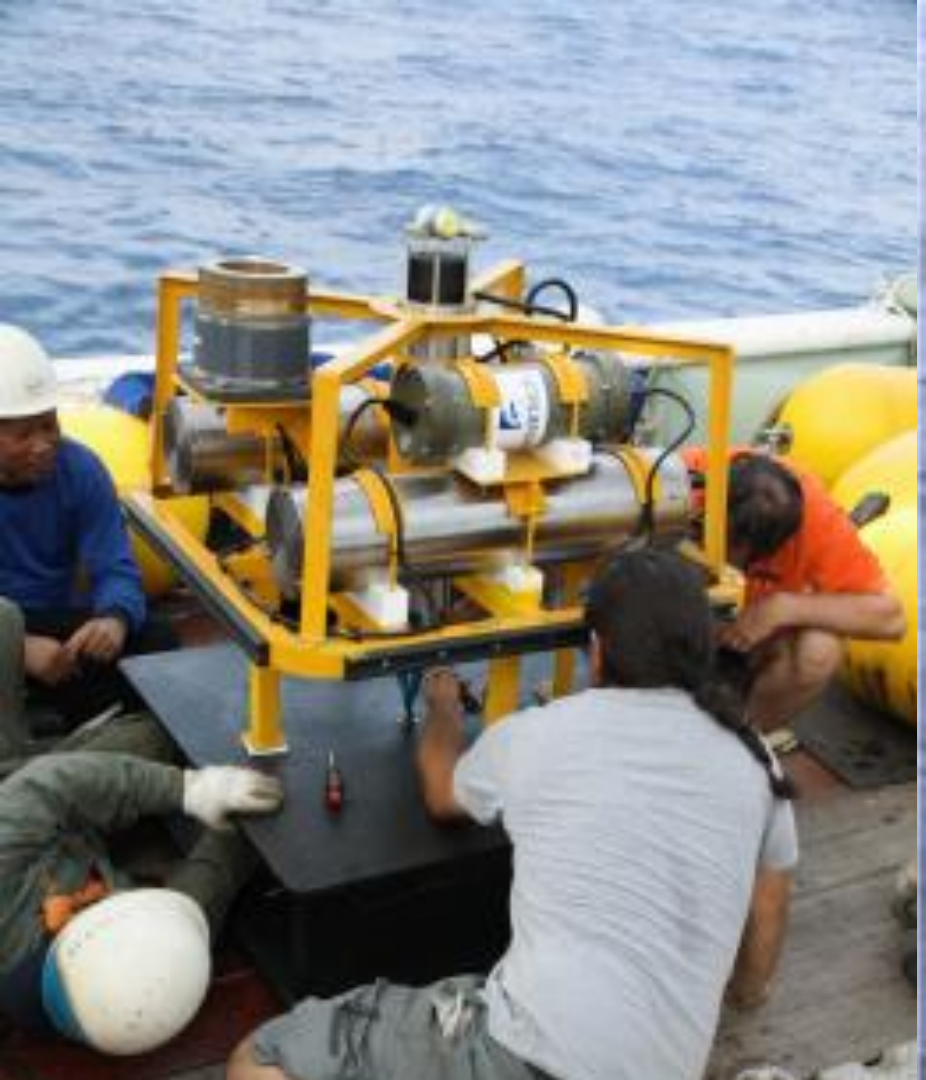
MK-III

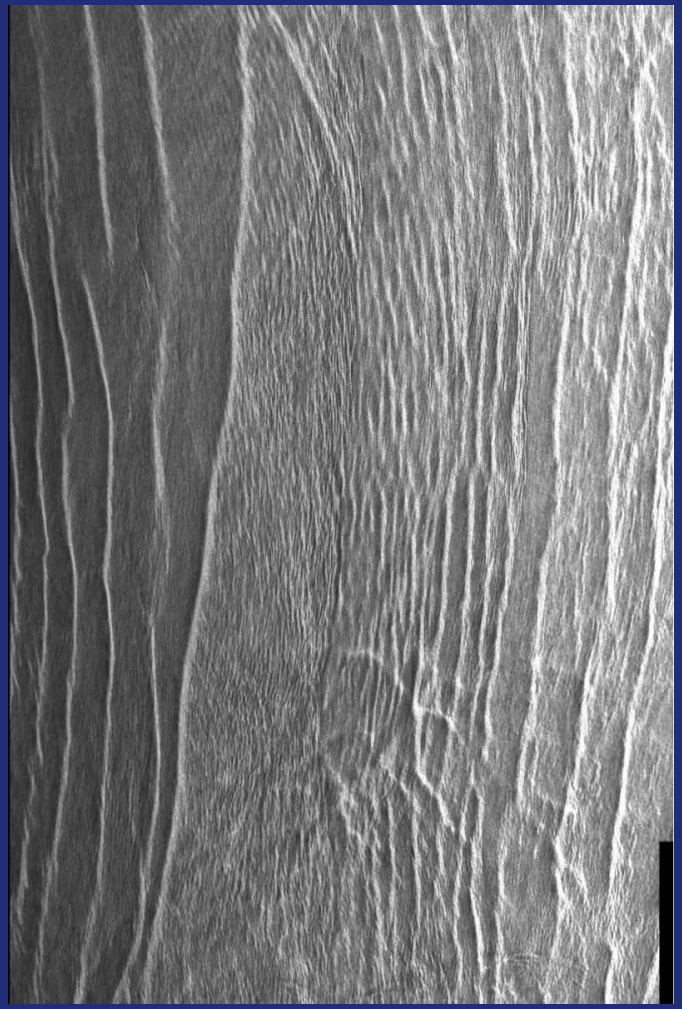
Assembling in Phuket

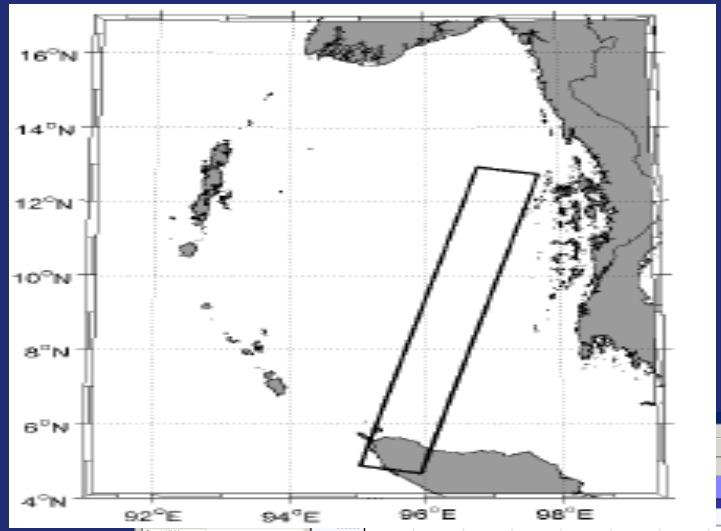


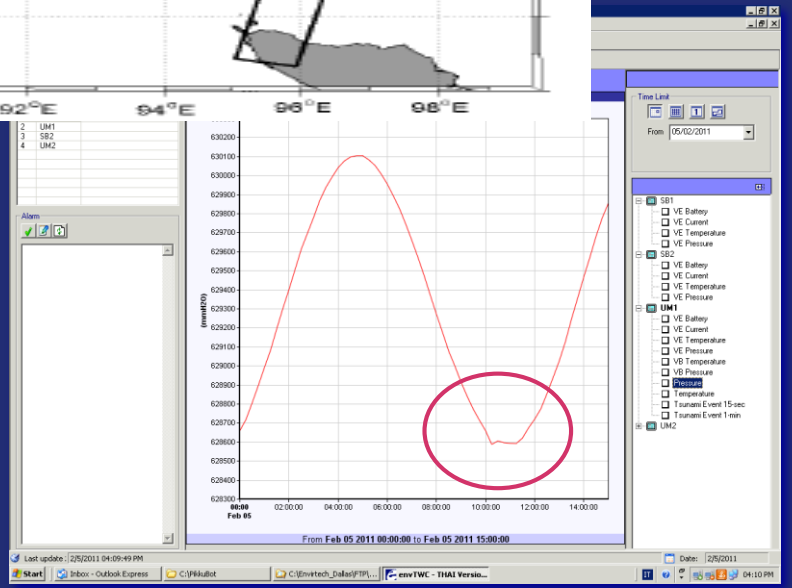
The special way to assemble the acoustic modems assures the best bidirectional data transfer rate.

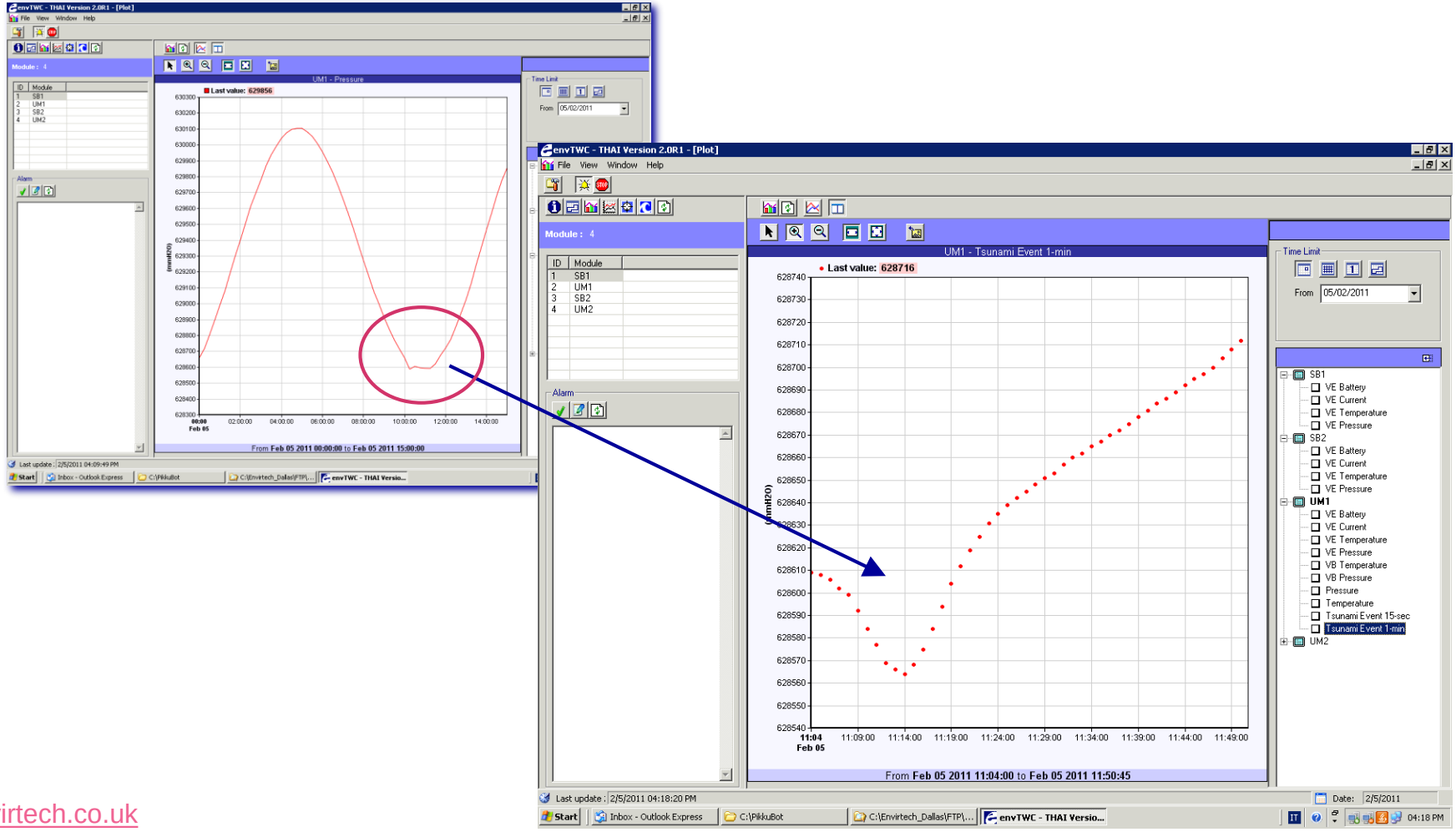

Thai-SM2
Thai-SM1
Ko Samui
Ko Phuket
Pulau Langkawi
Pulau We
Pulau Pinang






16°N
14°N
12°N
10°N
8°N
6°N
4°N
92°E
94°E
96°E
98°E


Time Limit
From 05/02/2011
SB1
VE Battery
VE Current
VE Temperature
VE Pressure
SB2
VE Battery
VE Current
VE Temperature
VE Pressure
UM1
VE Battery
VE Current
VE Temperature
VE Pressure
VB Temperature
VB Pressure
Pressure
Temperature
Tsunami Event 15-sec
Tsunami Event 1-min
UM2
Alarm
From Feb 05 2011 00:00:00 to Feb 05 2011 15:00:00


envTWC - THAI Version 2.0R1 - [Plot]
File View Window Help
Module : 4
ID Module
1 SB1
2 UM1
3 SB2
4 UM2
Alarm
UM1 - Pressure
Last value: 629856
From Feb 05 2011 00:00:00 to Feb 05 2011 15:00:00
UM1 - Tsunami Event 1-min
Last value: 628716
From Feb 05 2011 11:04:00 to Feb 05 2011 11:50:45
Time Limit
From 05/02/2011
SB1
VE Battery
VE Current
VE Temperature
VE Pressure
SB2
VE Battery
VE Current
VE Temperature
VE Pressure
UM1
VE Battery
VE Current
VE Temperature
VE Pressure
VB Temperature
VB Pressure
Pressure
Temperature
Tsunami Event 15-sec
Tsunami Event 1-min
UM2
Last update : 2/5/2011 04:18:20 PM
Date: 2/5/2011
Start
Inbox - Outlook Express
C:\PikkuBot
C:\Envirtech_Dallas\FTP\...
envTWC - THAI Versio...
04:18 PM

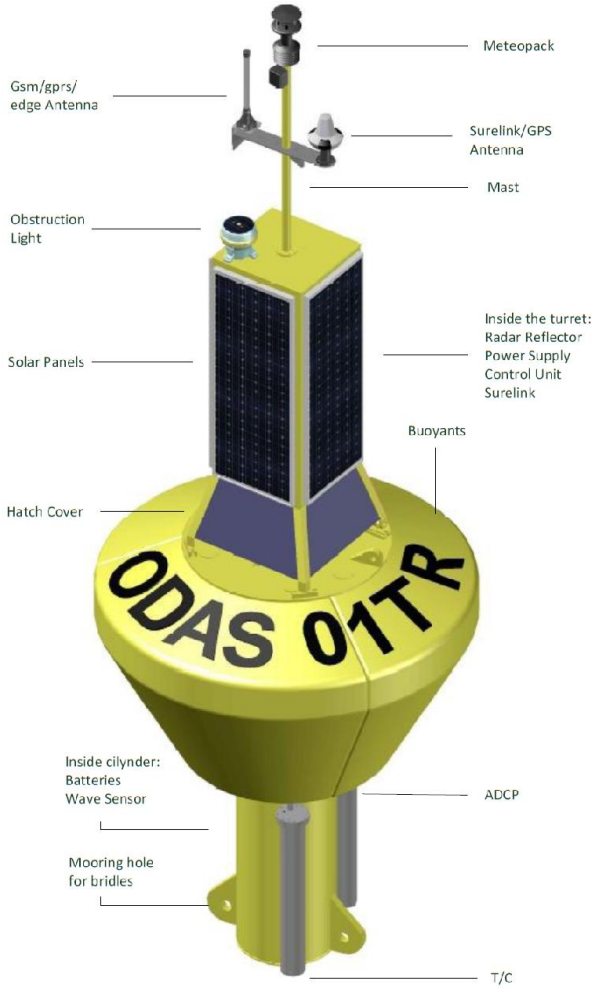
ODAS
Ocean Data Acquisition Systems

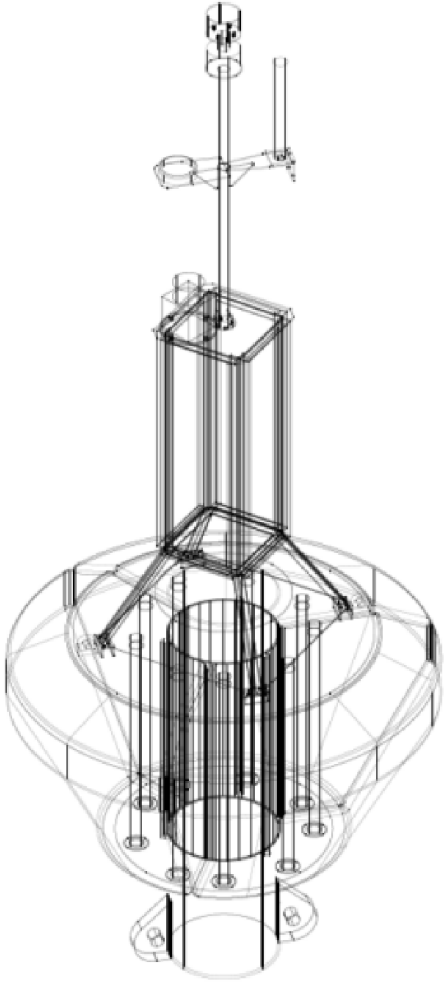
Envirtech MkI-3

Directional Wave buoy

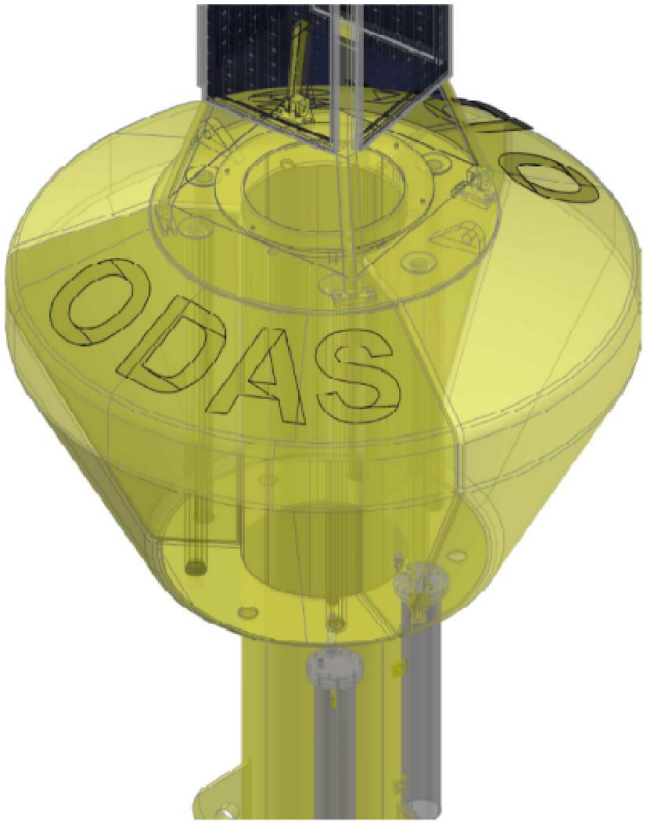

envitech.

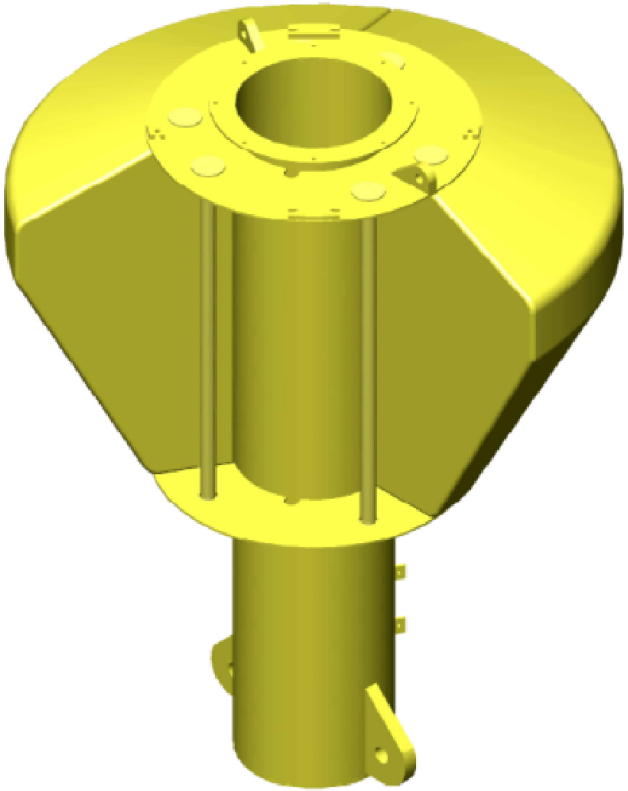

ODAS

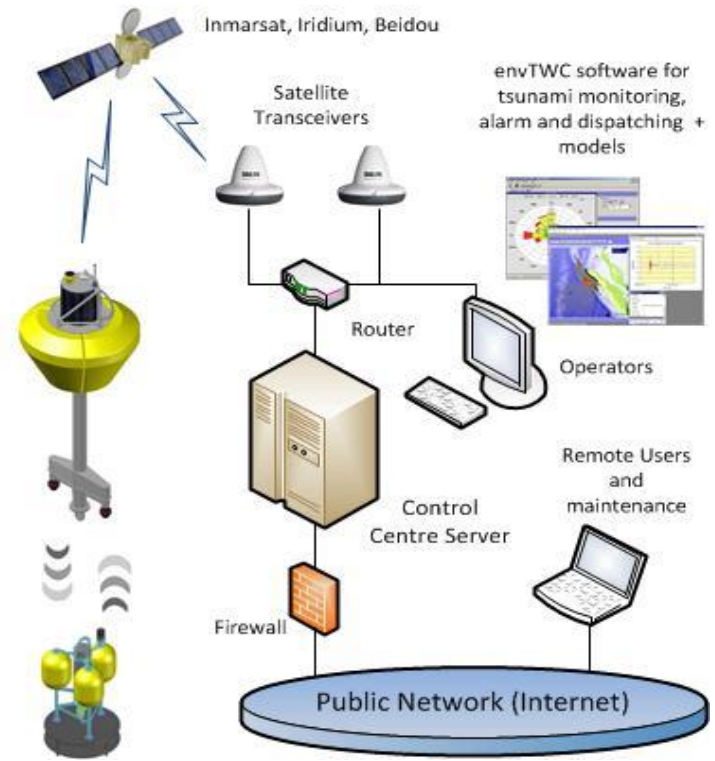

Meteopack
Gsm/gprs/
edge Antenna
Surelink/GPS
Antenna
Mast
Obstruction
Light
Inside the turret:
Radar Reflector
Power Supply
Control Unit
Surelink
Solar Panels
Buoyants
Hatch Cover
ODAS 01TR
Inside cilynder:
Batteries
Wave Sensor
ADCP
Mooring hole
for bridles
T/C

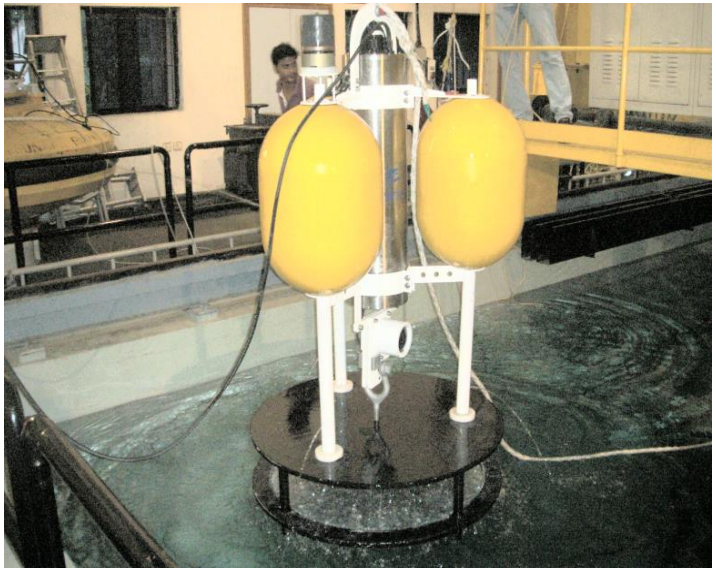



5300

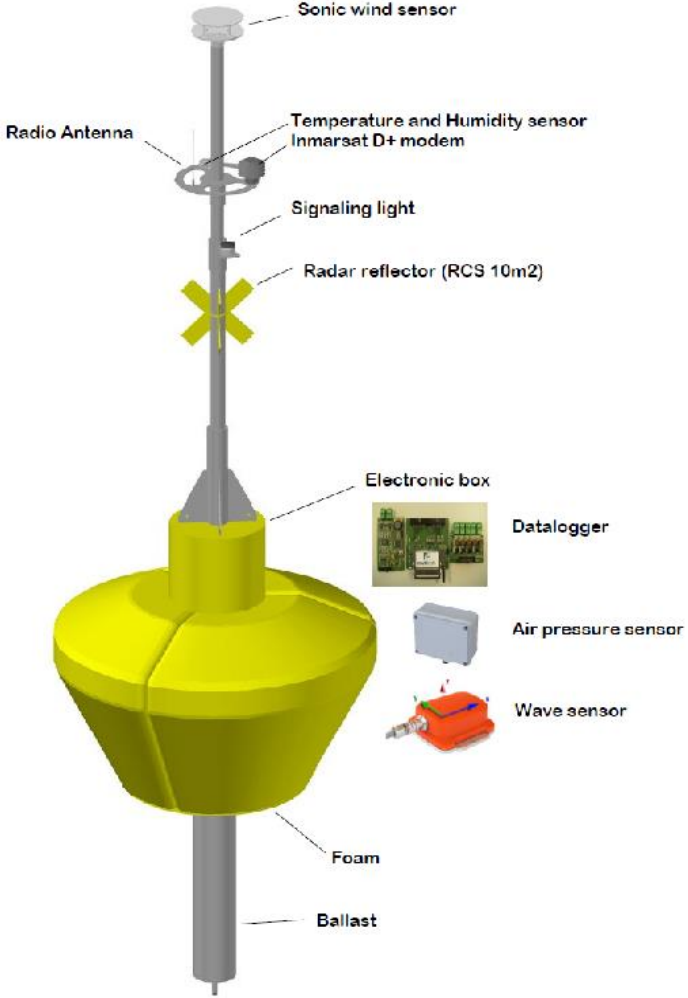

ODAS

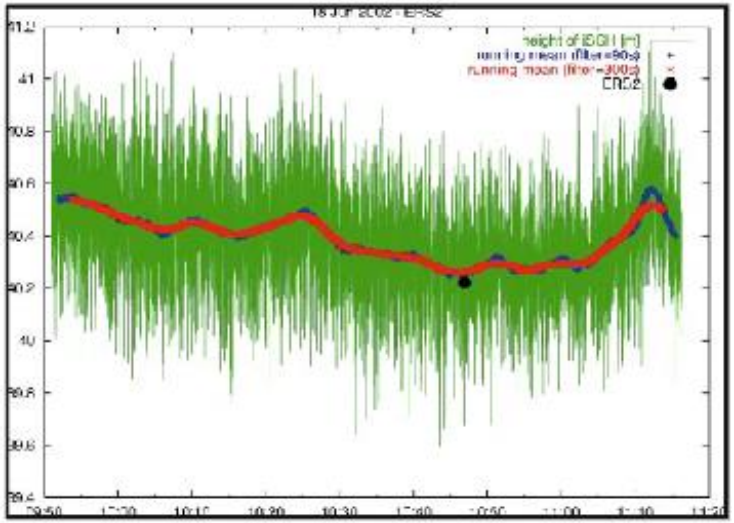



Inmarsat, Iridium, Beidou
Satellite Transceivers
envTWC software for tsunami monitoring, alarm and dispatching + models
Router
Operators
Remote Users and maintenance
Control Centre Server
Firewall
Public Network (Internet)



	Envirtech Deep Sea MKI-03	Fugro Oceanor Seawatch Wavescan	Axys Watchkeeper	Axys 3 meters
Project Date	**2007**	1985	2000	1997
Displacement	**782 Kg**	924 Kg	540 Kg	1500 Kg
Buoyant Dimensions	**3 sectors assembled as conical shape (PATTENTED) 1800x1176 mm**	2 semi-discus Assembled to shape a dish 2800 mm	1 piece conical 1700 mm	1 piece Discus 3000 mm
Above sea level	**3800 mm**	4500 mm	2500 mm	2400 mm
Under sea level	**1950 mm**	1500 mm	1000 mm	1000 mm
Buoyant Hull	**Rotationally moulded polyethylene**	Polyethylene	Rotationally moulded polyethylene	Aluminum
Electrical	**Independent Solar Panels up to 200W Lithium Battery up to 4000 Amph**	Solar Panels 80 Watt Optionally Lithium pack up to 1540 Amph	Solar Panels 80 Watt	Solar Panels 80 Watt
Directional Wave Sensors	**micro technology sensors (avionic derived) Sample rate 10 Hz Band 1.56 seconds to 33.33 seconds**	Slope-Following MRU Heave/Slope in oil gear (similar to Datawell wavec sensor)	Triaxys solid state sensors: Band 1.56 seconds to 33.33 seconds	Triaxys solid state sensors: Band 1.56 seconds to 33.33 seconds
Range **Accuracy** **Direction 0 - 360°** **Wave Period**	**Heave, DXX-DYY ±25m** **< 0.5 cm** **< 0.05°** **0.5-35sec < 0.1% of value**	Heave, Surge, Sway ±15m < 10cm 0.3° 2-30sec < 2% of value	Heave, DXX-DYY ±20m 1 cm < 0.1° 0.5-30sec < 1% of value	(not recommended)





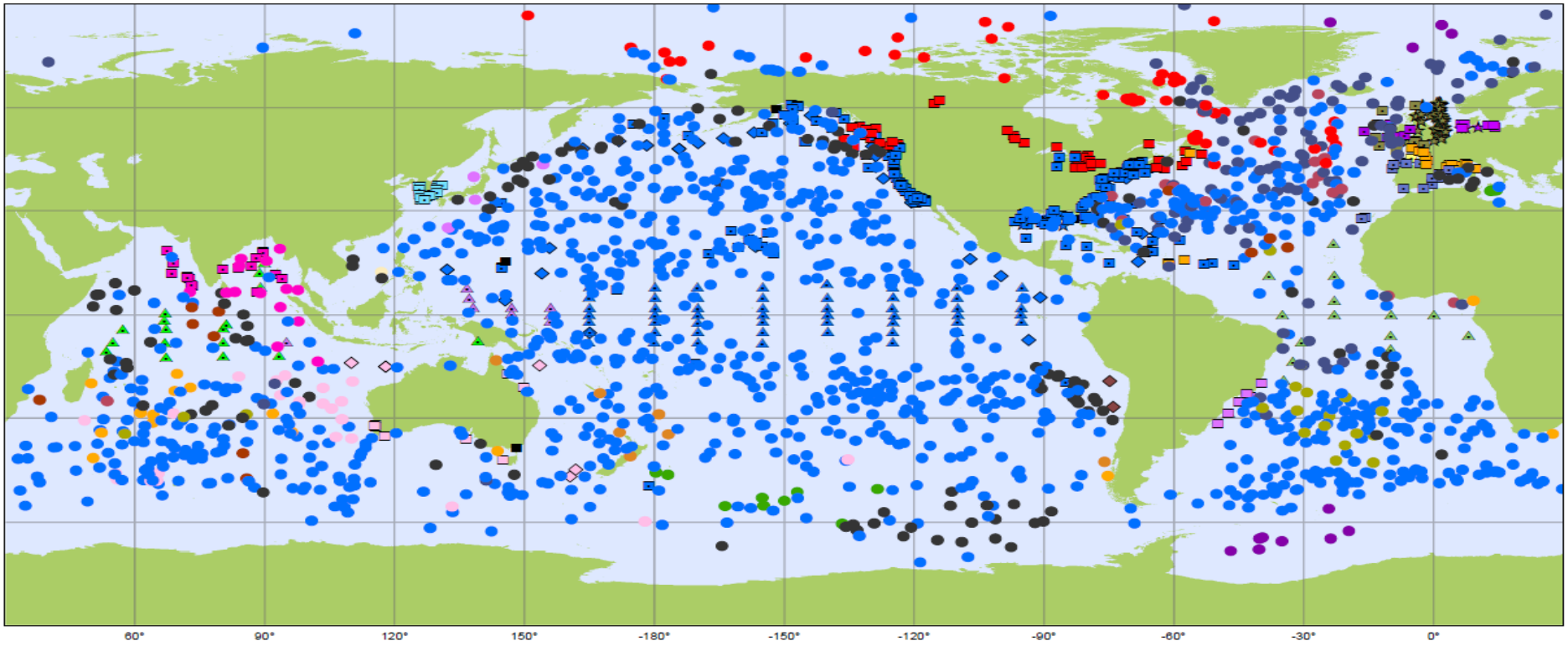
Payload composed of a multisatellite multichannel (70 CH) Glonass – GPS – Galileo receiver.

Measuring procedure recognized by WMO

Data Buoys Coverage

WORLD

August 2016



Data Buoy Cooperation Panel

Platform Operating Countries

August 2016

Platforms operational during the month. GTS data as received by Meteo France.

Drifting Buoys

- AUSTRALIA (25)
- CANADA (50)
- EUROPE (113)
- FRANCE (15)
- GERMANY (13)
- HONG KONG (1)
- INDIA (14)
- ITALY (14)
- JAPAN (4)
- NEW ZEALAND (7)
- UK (20)
- US-FR (11)
- USA (1054)
- USA-EU (16)
- UNKNOWN (145)

Coastal/National MB

- AUSTRALIA (8)
- BRAZIL (7)
- CANADA (41)
- FRANCE (22)
- GERMANY (6)
- INDIA (18)
- IRELAND (6)
- REPUBLIC OF KOREA (17)
- SPAIN (15)
- UK (9)
- UK/FRANCE (1)
- USA (178)
- UNKNOWN (9)

Tropical MB

- BRAZIL/FRANCE/US (16)
- JAPAN (9)
- USA (53)
- USA/INDIA (17)

Tsunameters

- AUSTRALIA (5)
- CHILE (2)
- USA (28)

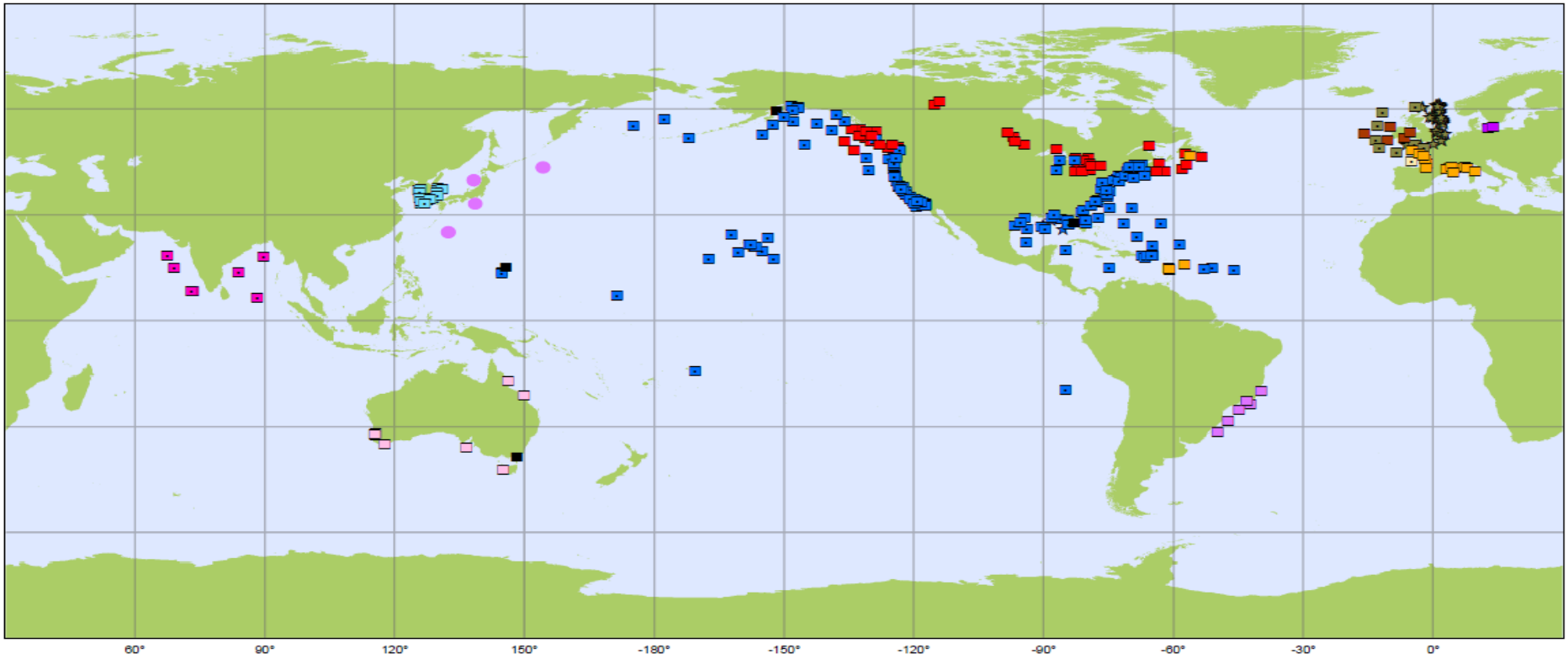
Fixed Platforms

- GERMANY (3)
- USA (9)
- UK (91)

Drifting 1,500

Moored 570

Generated by www.jcommops.org, 20/09/2016



Data Buoy Cooperation Panel

Wave Observations

August 2016

Platforms providing Wave observation measurements to the GTS during the month. GTS data as received by Meteo France.

Drifting Buoys

- JAPAN (4)

Coastal/National MB

- IRELAND(5)
- AUSTRALIA(8)
- BRAZIL(7)
- CANADA(41)
- FRANCE(21)
- GERMANY(2)
- INDIA(7)
- REPUBLIC OF KOREA(17)
- UK(8)
- UK/FRANCE(1)
- USA(161)
- UNKNOWN(9)

Fixed Platforms

- ★ UK(50)
- ★ USA(5)

Wave = 342 about 60% of moored buoys

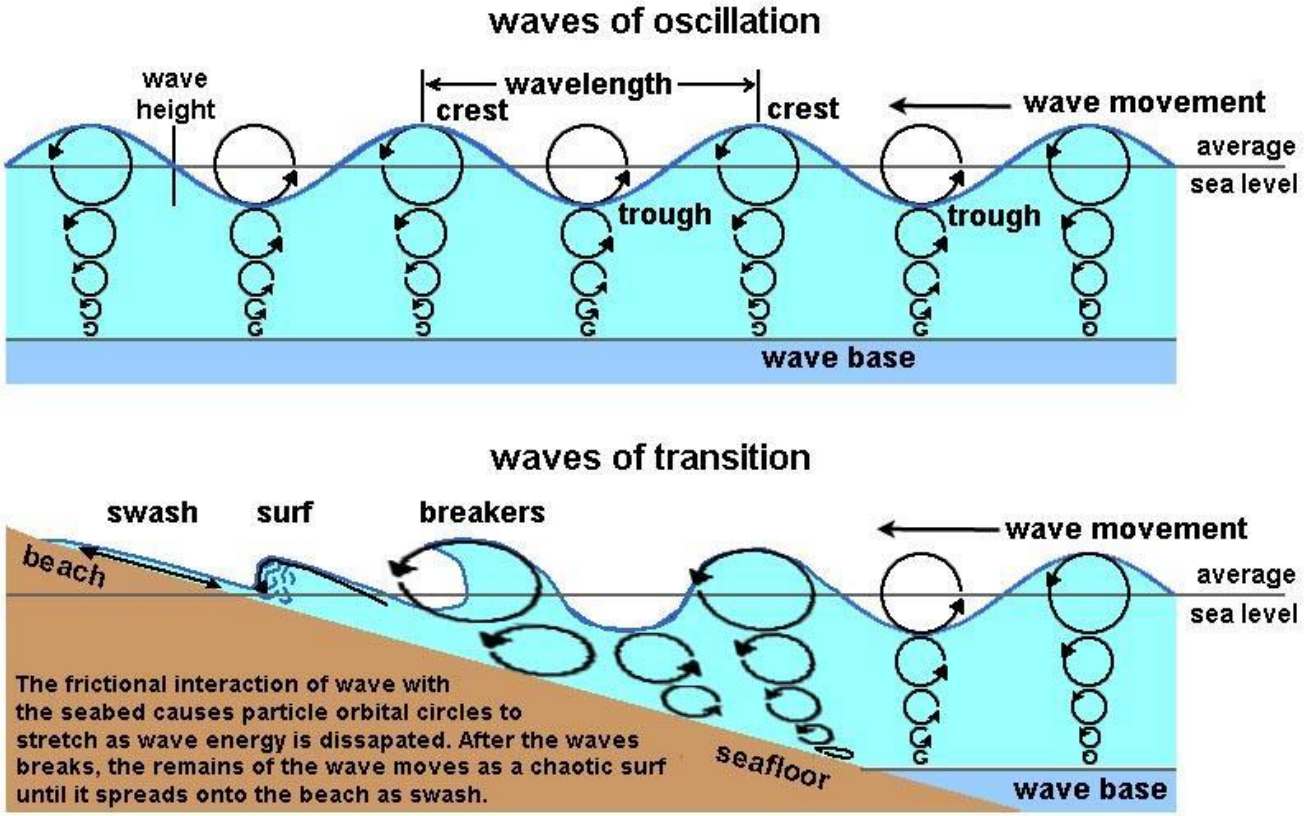
Generated by www.jcommops.org, 20/09/2016

"Stiamo distruggendo la domanda interna tramite il consolidamento fiscale"

(Mario Monti alla CNN - 2013)

Measuring waves On site Is NOT easy

Circular paths of particles due to oscillations from passing waves



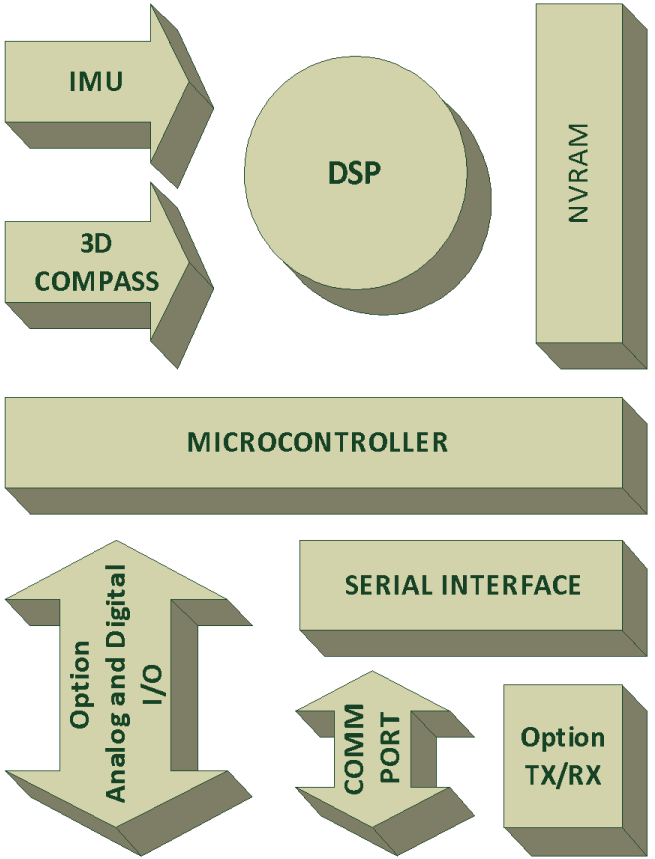
Types of waves

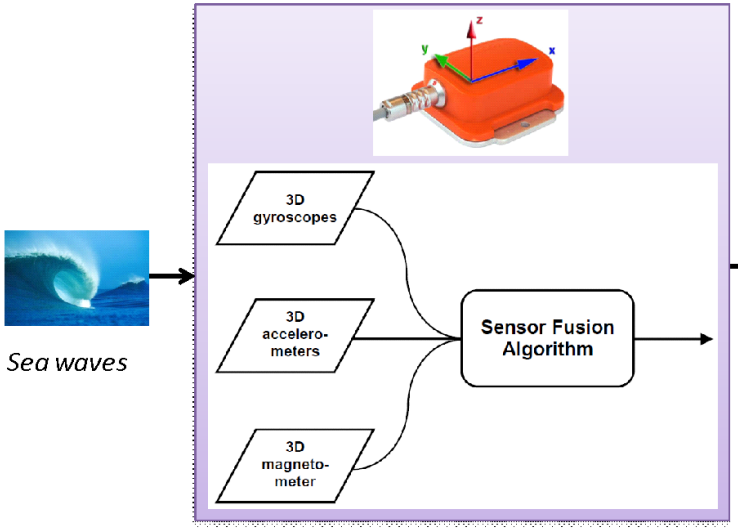
Surface Gravity Waves	Tsunamis and infra-gravity waves	Gravity Tides
• Height = range from small ripples up to 20 meters • Periods = 1.5 – 30 sec • Speed = 10 – 120 Km/h	• Height = open ocean < 0.5 meters; onshore < 90 meters • Speed = jet-liner speeds 600-800 Km/h • Wavelength = 100's of kilometers • Periods = minutes	• Height = up to + 15 meters • Period $12^{h}\,25^{m}$ to $24^{h}\,50^{m}$
ON SITE MEASURING PRINCIPLE/TECHNOLOGY		
Inertial Acoustic Doppler GNSS (GPS, DGPS, etc.) Air gap (microwaves, optical or acoustic) Slope following Diff. Pressure	In Ocean: Absolute Pressure, Post-processed GNSS. on shore: Air gap (microwaves, optical or acoustic), pressure, buoyant	Buoyant Pressure Air gap (microwaves, optical or acoustic)

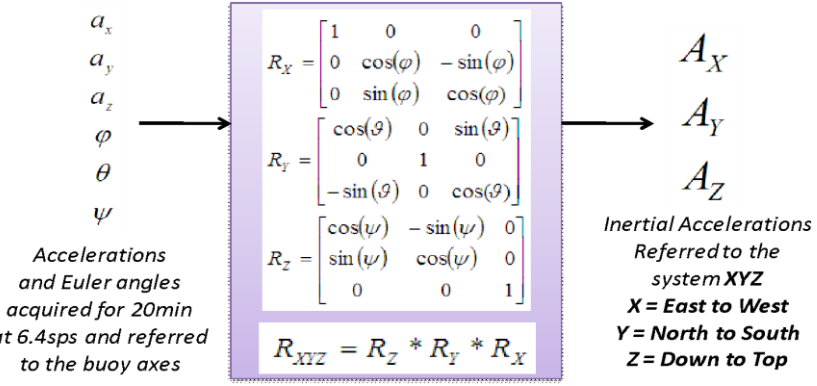
Envirtech MK-VII
50cm Data buoy

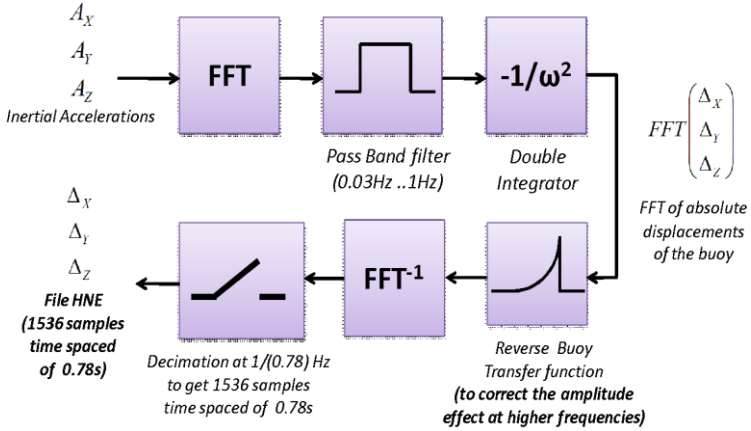
Envirtech DWSP - Directional Wave Sensor Payload

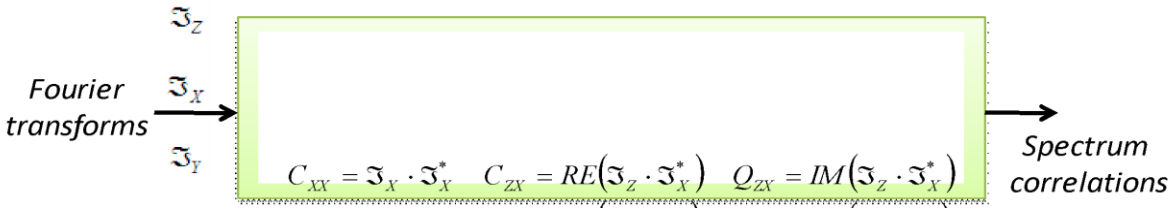
GENERAL INFORMATION (AS BUOY PAYLOAD)	
Wave Height/Heave	Range -25 .. 25 m Resolution 1 mm Accuracy < 2 mm
Period	Range 1.0 .. 33 sec Resolution 0.1 s Accuracy 0.1 s
Direction	Range 0 .. 360 ° Resolution 0.2° Accuracy 1°
Raugh Sampling rate	Standard 6.4 samples per seconds Up to 100 samples per second

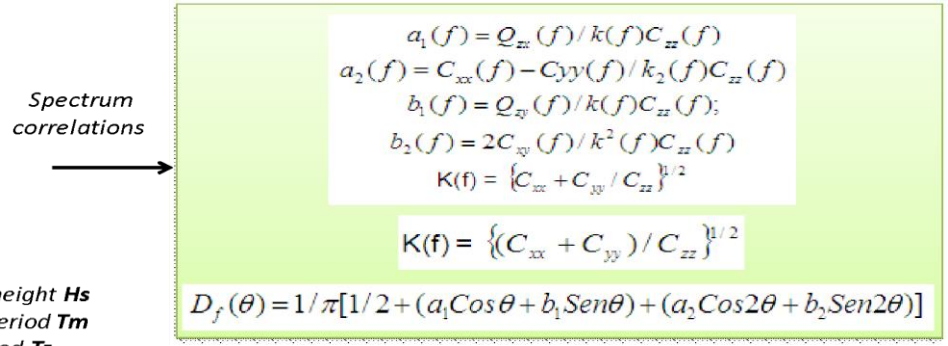


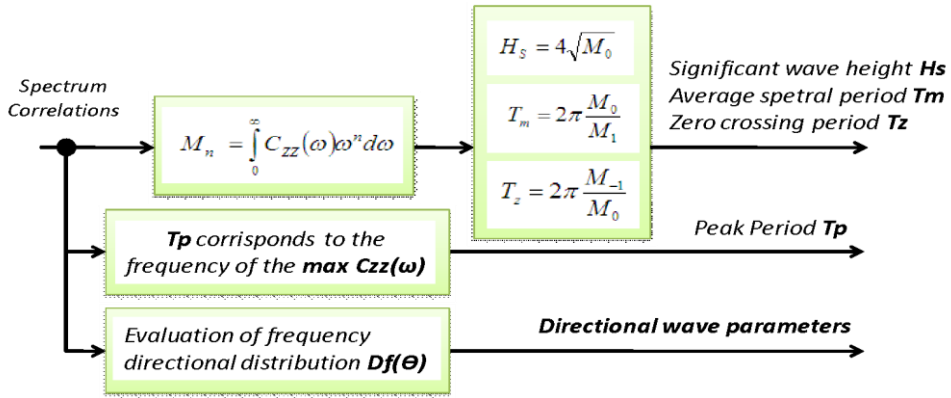

3D gyroscopes
3D accelero-meters
3D magneto-meter
Sensor Fusion Algorithm
Sea waves
a_x a_y a_z φ θ ψ
Accelerations and Euler angles acquired for 20min at 6.4sps and referred to the buoy axes


a_x a_y a_z φ θ ψ
Accelerations and Euler angles acquired for 20min at 6.4sps and referred to the buoy axes
$R_X = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\varphi) & -\sin(\varphi) \\ 0 & \sin(\varphi) & \cos(\varphi) \end{bmatrix}$
$R_Y = \begin{bmatrix} \cos(\vartheta) & 0 & \sin(\vartheta) \\ 0 & 1 & 0 \\ -\sin(\vartheta) & 0 & \cos(\vartheta) \end{bmatrix}$
$R_Z = \begin{bmatrix} \cos(\psi) & -\sin(\psi) & 0 \\ \sin(\psi) & \cos(\psi) & 0 \\ 0 & 0 & 1 \end{bmatrix}$
$R_{XYZ} = R_Z * R_Y * R_X$
A_X A_Y A_Z
Inertial Accelerations Referred to the system XYZ
X = East to West
Y = North to South
Z = Down to Top


A_X A_Y A_Z
Inertial Accelerations
FFT
Pass Band filter (0.03Hz ..1Hz)
$-1/\omega^2$
Double Integrator
$FFT\begin{pmatrix}\Delta_X\\ \Delta_Y\\ \Delta_Z\end{pmatrix}$
FFT of absolute displacements of the buoy
Reverse Buoy Transfer function
(to correct the amplitude effect at higher frequencies)
FFT^{-1}
Decimation at 1/(0.78) Hz to get 1536 samples time spaced of 0.78s
Δ_X Δ_Y Δ_Z
File HNE (1536 samples time spaced of 0.78s)





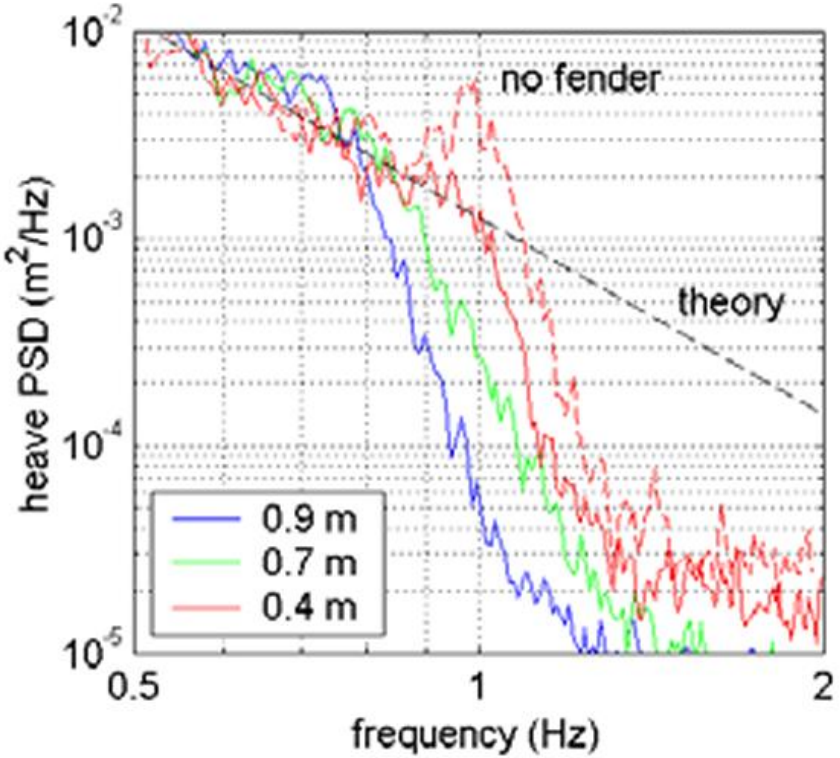


NOAA NDBC
Tech.Doc.96-01
Nondirectional and Directional Wave Data Analysis Procedures

Envirtech MK-VII

	Envirtech MK-VII	Datawell DWR-G4
Project Date	2016	2006
Displacement	30 Kg	17 Kg
Buoyant Dimensions	Sphere Φ 50cm	Sphere Φ 40cm
Buoyant Hull	Rotationally moulded Polyethylene + Aisi316	AISI 316
Power pack	Rechargeable lithium-ion battery 60-90 days	Primary Alkaline manganese dioxide – zinc battery 30 days
Standard Telemetry	GSM/GPRS + Inmarsat	HF / 25 Km + Argos
Directional Wave Sensors	micro technology sensors Sample rate up to 90 Hz Band 1.56 to 33.33 seconds	GPS receiver, not differential, SA vulnerable
Range Accuracy Direction 0 - 360° Wave Period	Heave, DXX-DYY ±25m < 0.5 cm < 0.1° 0.5 to 35 sec < 0.1% of value	Heave, DXX-DYY ±20m 1-2cm each direction Band 1.6 to 20 seconds
SST	0.1 °C - Internal hull	0.2°C - Internal Hull

Heave response in free floating



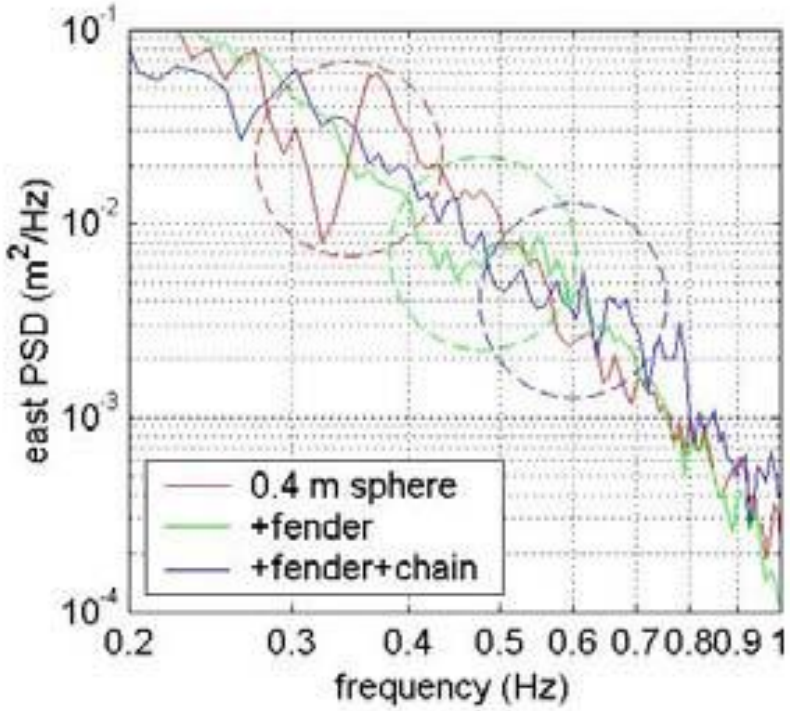
Measured heave spectrum (Power Spectral Density) of a 70-centimetre and 90-centimetre Waverider, and a 40-centimetre diameter sphere with and without fender.

The theory curve is a simple power law based on the low frequency measurements.

Theory shows that the heave response of a sphere, submerged up to its equator, has a resonance just below the cut-off frequency.

The bigger buoys, equipped with a fender as standard, show no resonance (blue and green curves). They do illustrate the increasing cut-off frequency versus decreasing buoy diameter.

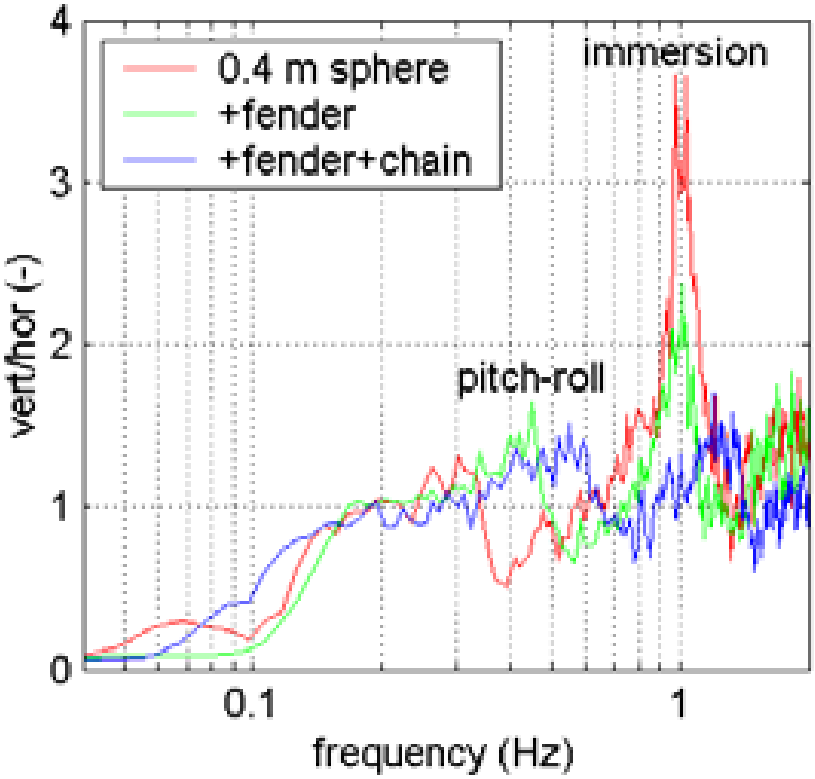
Pitch-roll resonances



Detail of the wave spectral horizontal (east) energy (Power Spectral Density).

Pitch-roll resonances are encircled

Overall hydrodynamic performance



The overall hydrodynamic performance can be studied by measuring the square root of the ratio of the vertical energy and the horizontal energy – the so called check ratio.

In the case of circular orbits (as in waves in deepwater), this ratio is unity.

In shallow-water, when the orbits are horizontal ellipses, the energy ratio is less than unity. The results of experiments at sea with free-floating buoys, with some wind waves present and hardly any swell, are presented.

The heave resonance around 1Hz is clearly seen, as is the pitch-roll resonance at lower frequencies.

EnvirTech

ODDN

On-Demand Data Network

A new paradigm for environmental data gathering

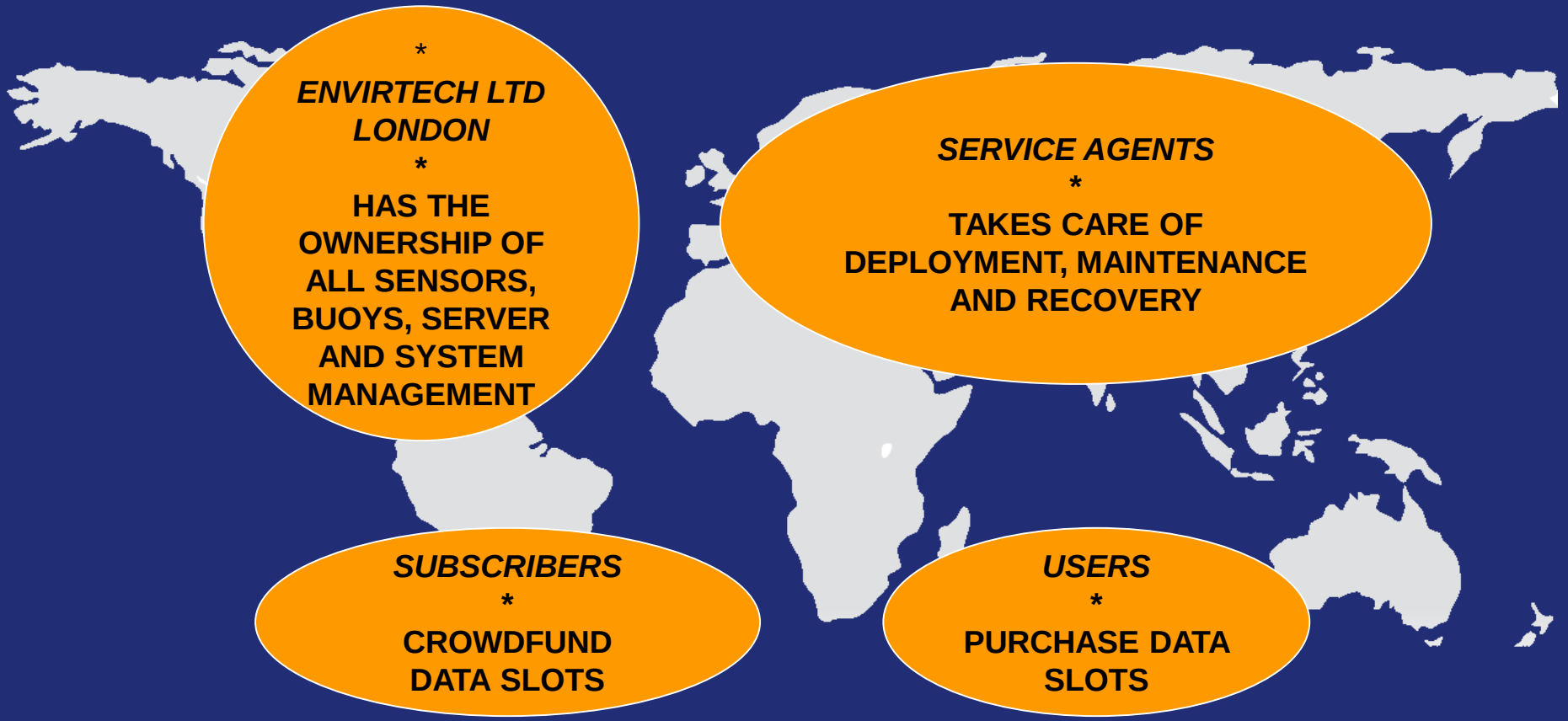
WHAT IS ODDN ?

ODDN IS A SERVICE, ITS FEATURES ARE :

TURNKEY SOLUTION
METEOROLOGIC/HYDROLOGIC /OCEANOGRAPHIC SENSORS
REDUNDANT ARCHITECTURE
REAL TIME DATA DISPATCHED VIA HTTPS, SFTP
LOCAL SERVICE
ONLINE VERIFIABLE CROWDFUNDED CAMPAIGNS
ONLINE VERIFIABLE RETURN OF THE INVESTMENT

Available in selected locations starting April 2017

WHO IS INVOLVED ?



*

ENVIRTECH LTD LONDON

*

HAS THE OWNERSHIP OF ALL SENSORS, BUOYS, SERVER AND SYSTEM MANAGEMENT

SERVICE AGENTS

*

TAKES CARE OF DEPLOYMENT, MAINTENANCE AND RECOVERY

SUBSCRIBERS

*

CROWDFUND DATA SLOTS

USERS

*

PURCHASE DATA SLOTS

HOW IT WORKS ?

Subscribers

LOCATIONS

FRANCE

Le Havre

Tolon

Marseille

...

ITALY

Leghorn

Genoa

...

UK

South.nt

Brighton

…

...

SENSORS

Physics

- Meteo
- Waves
- Current
- ...

Biochemical

- pH
- DO
- Chlor.
- Turbidity
- …

...

PRICE = *f* (location,sensors)

Price based on location and selected sensors for a "**3 months slot**" renewable before expiration.

ALL COMPREHENSIVE

- SENSORS
- CALIBRATION
- DEPLOYMENT
- MAINTENANCE
- RECOVERING

HOW MUCH IS A SLOT COST ?

PRICE FOR AN AVERAGE LOCATION

DIRECTIONAL WAVES + SEA SURFACE TEMPERATURE
GEOREFERENCED REAL TIME DATA COLLECTION

1 SLOT (3 MONTHS) = EUR 4,500

4 SLOTS = 1 YEAR
EUR 15,000 (in place of 18,000)

DELIVERY 30-45 DAYS AFTER THE ORDER


WHAT'S NEXT?

HOW TO PAY FOR A SLOT ?

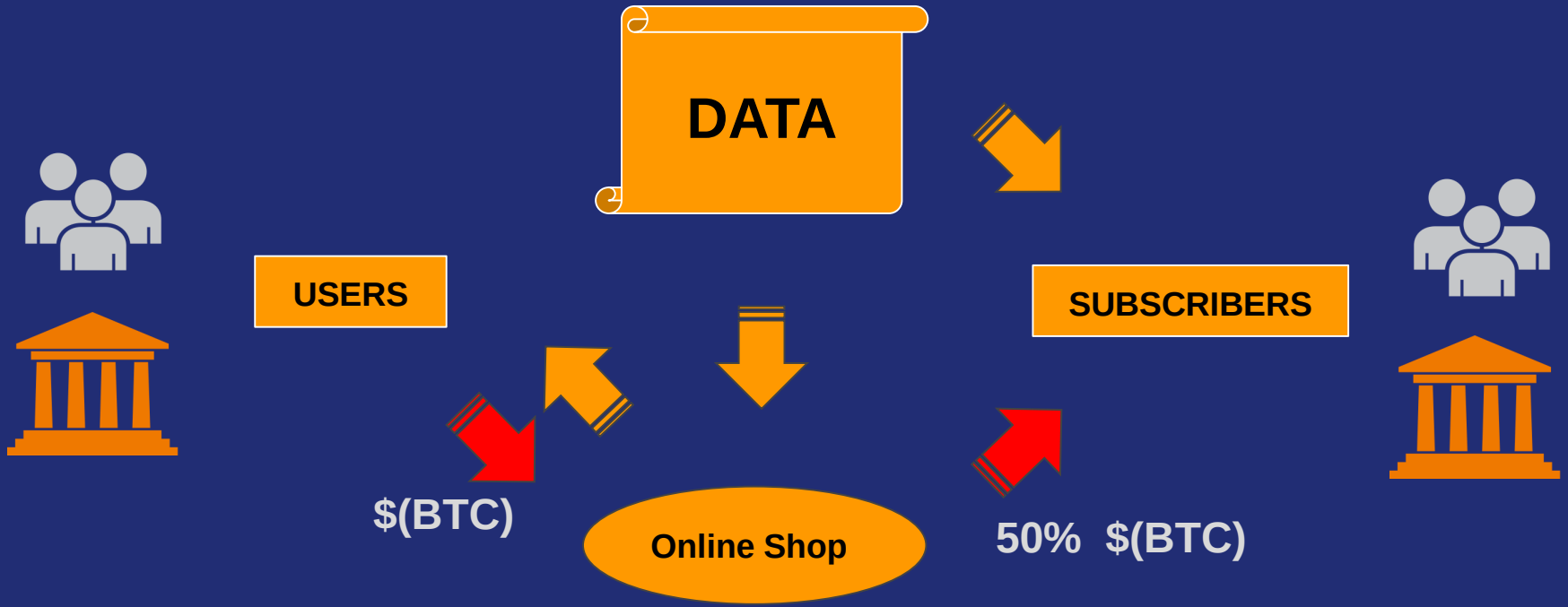
CROWDFUNDING IN BITCOIN (OR ETHER) FOR EACH LOCATION

Genoa	**"1LGrpg6fjb9GfF65SweiHkM9JZDxsw5Edm"**
Leghorn	"16nhyphCbYAmZ2BwUc7Zdve7WVBZoQfZdi"
Salerno	"14Ajg4vgHUyjoXxKkAhvXKHdq9xvvRUpHN"
Palermo	"1LPkF2CNcgZ9q9BVa8c2YsDuzjerXLQuB7"
Catania	"166dLyQyTZMkPrFTzL95SW8CVZ1CFDfXrU"
Gioia T.	"115o56jKbmGW3WR4ViCPjbWLPZjsv8YWrh"
Brindisi	"1MszJMZqGu8ur1nqTqyRkKAWP4GzwUhnQw"
Venezia	"1A5uEZWM5bZ19L8fEFBvCH9nsge2Me19gL"

CHECKABLE AT ANY TIME ON: https://blockchain.info

Within 30 days

HOW TO HAVE A ROI ?



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THANK YOU
FOR YOUR ATTENTION

ANY QUESTIONS ?