SECOAS – a coastal sensornet

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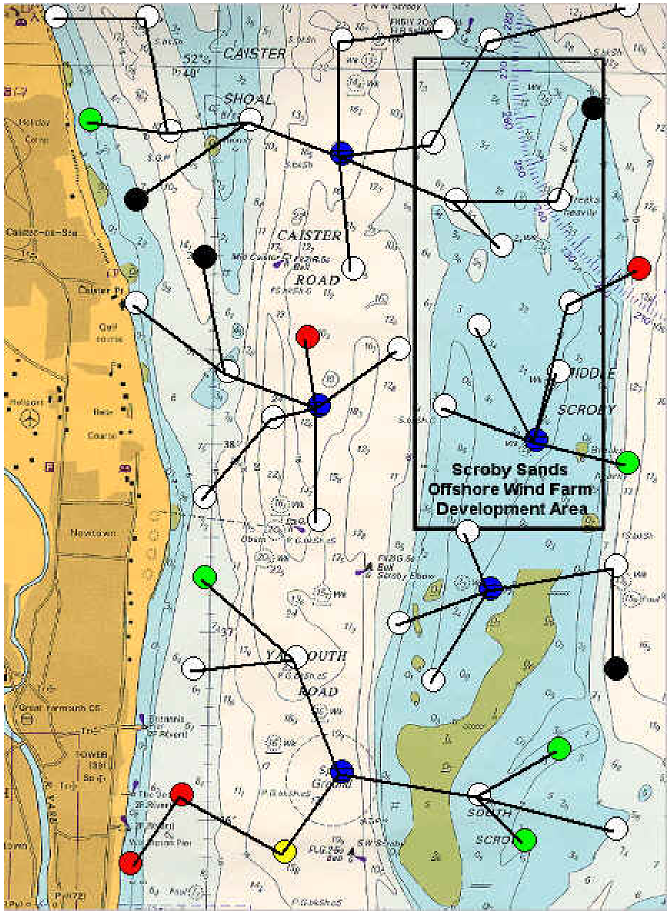
Test Site



Scroby sands wind farm and its impact on the surrounding environment

CEFAS Survey

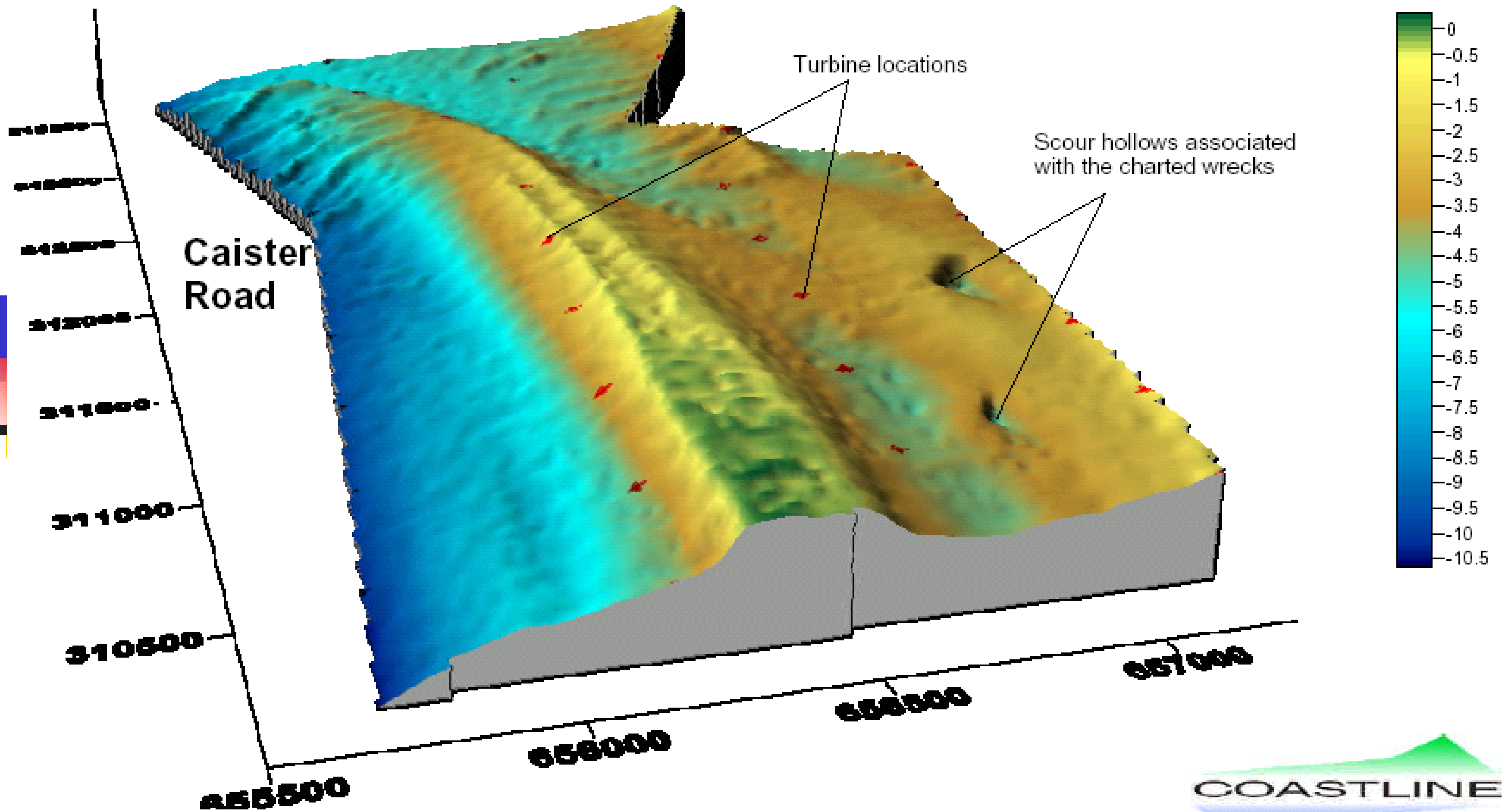


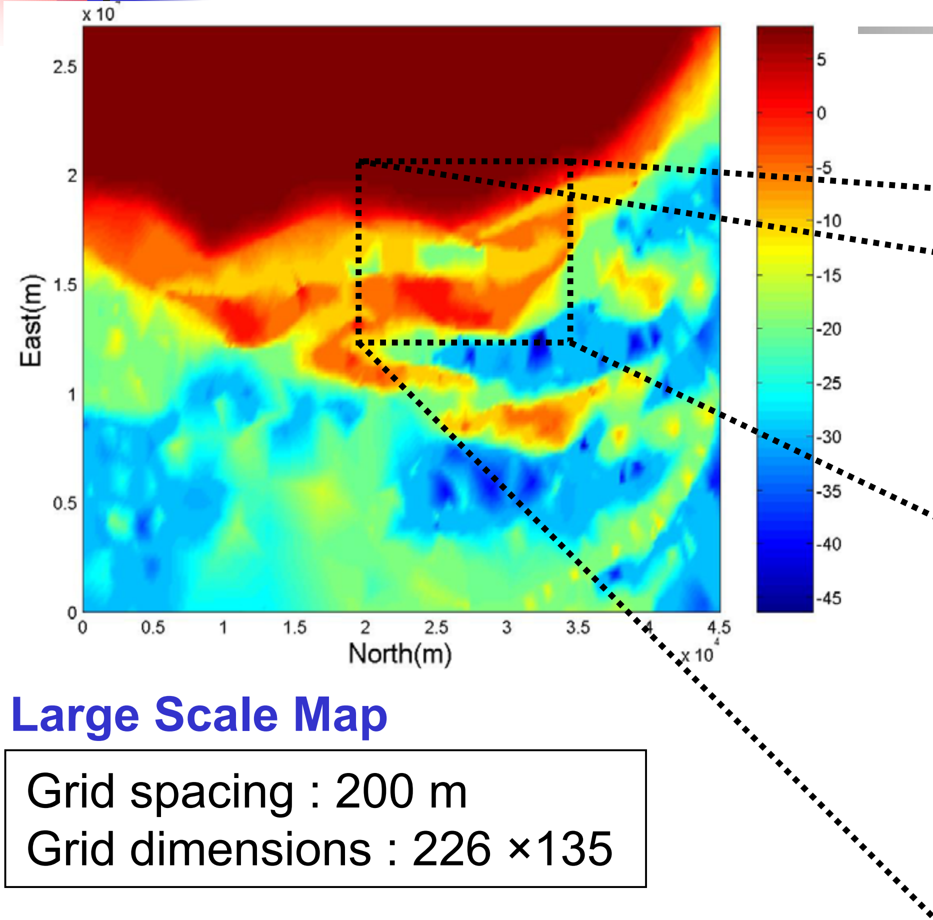
Figure 1: Scroby Sands April 2002 rendered surface image. Depths to Chart Datum. Positions to OSGB36.

April 2002

Introduction of Wave Models

	REFRAC	**PK**
Governing Equation	Wave energy conservation (Refraction)	Elliptic mild slope eq. (combined refraction and diffraction)
	shoaling, partial breaking , bottom friction, no reflection	
Calculations	monochromatic wave, open boundary condition limited ranges in wave direction(±30°), regular square girds	
Advantages	Able to nest, economical in running time and storage	More accurate, suitable for complex wave interaction modeling
Disadvantages	No diffraction	Limited to very small area and complicated bathymetry uneconomical computing costs

Bathymetry of Scroby Sands

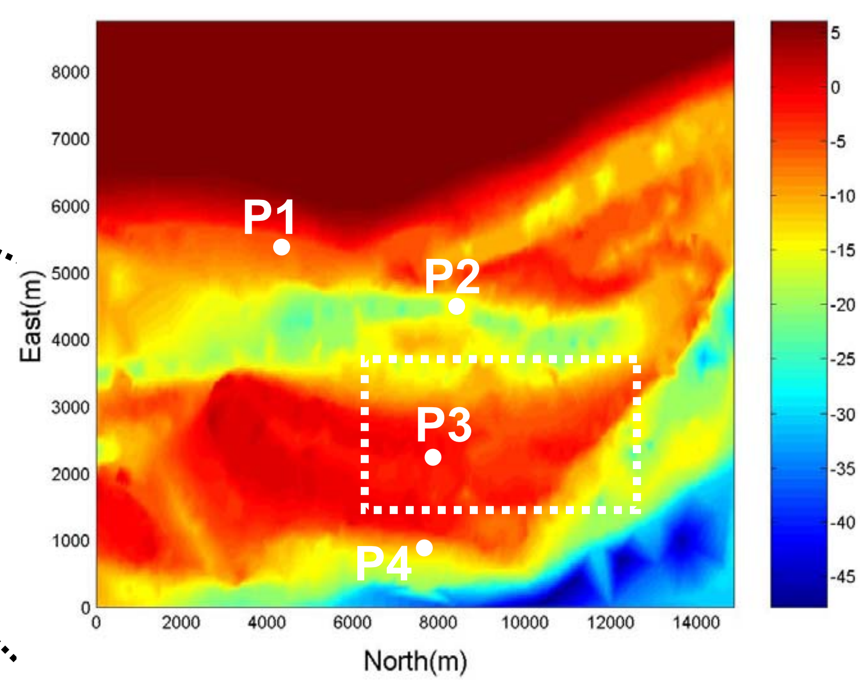


Large Scale Map

Grid spacing : 200 m
Grid dimensions : 226 ×135

Small Scale Map

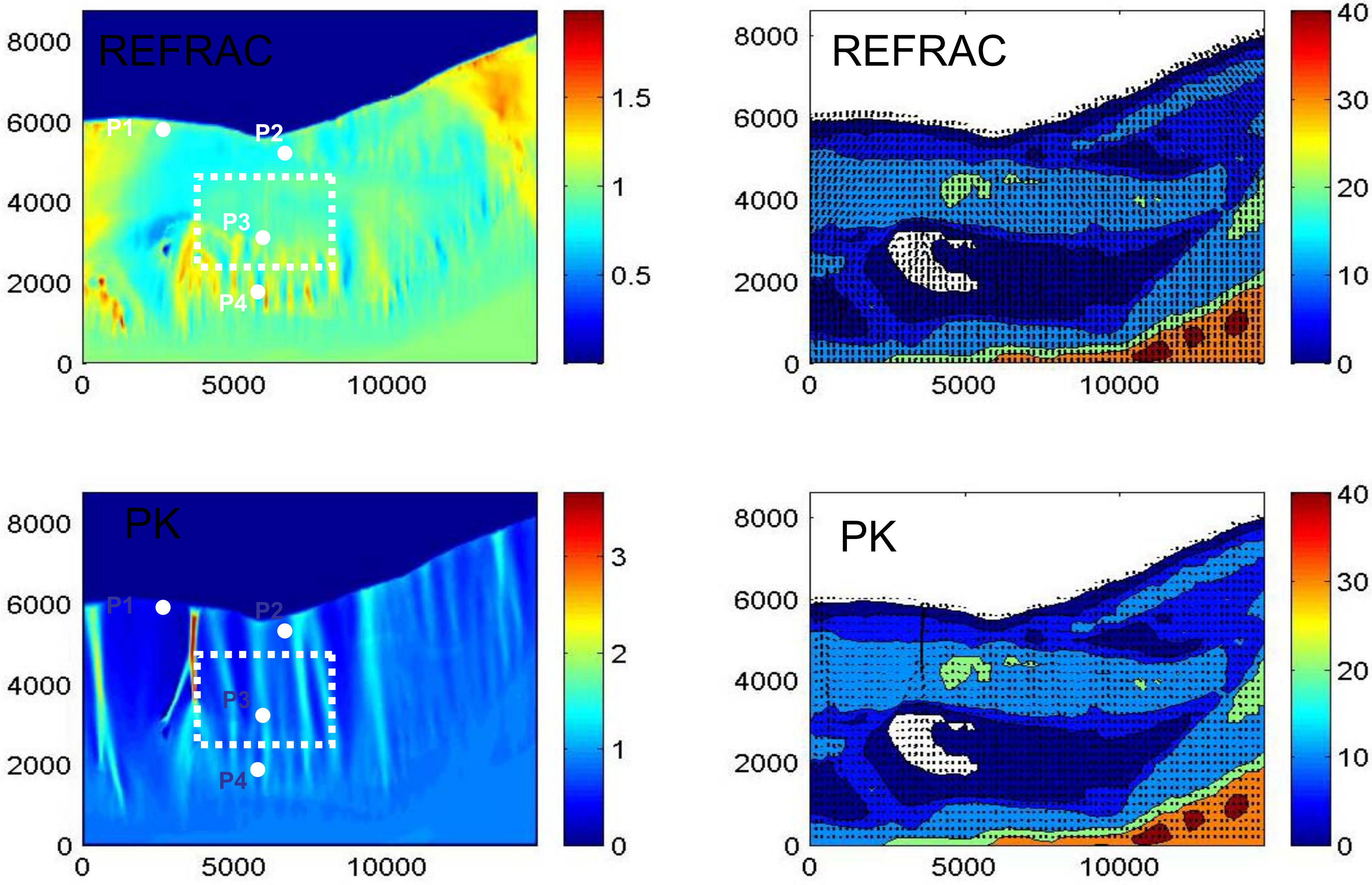
Grid spacing : 50 m
Grid dimensions : 298 ×176



Comparing with Real Data(CEFAS)

Input condition : 14/05/03 18:00 @ P1 from CEFAS data

Hs : 1.13 m, Ts : 6.95 sec, θ : 0°, h : H.W.S



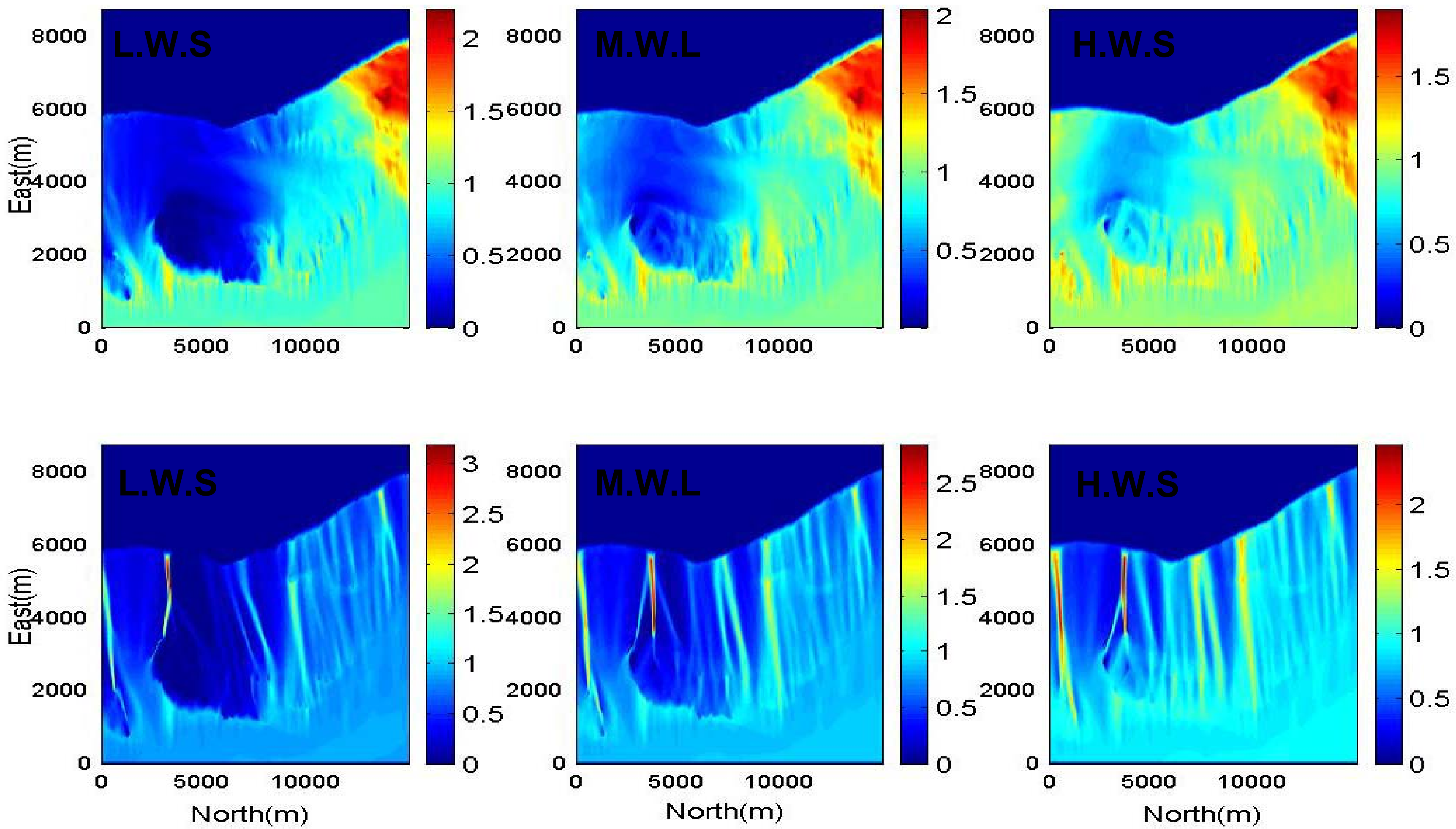
Comparing with Real Data(CEFAS)

Input condition : 14/05/03 18:00 @ P1 from CEFAS data
Hs : 1.13 m, Ts : 6.95 sec, θ : 0°, h : H.W.S

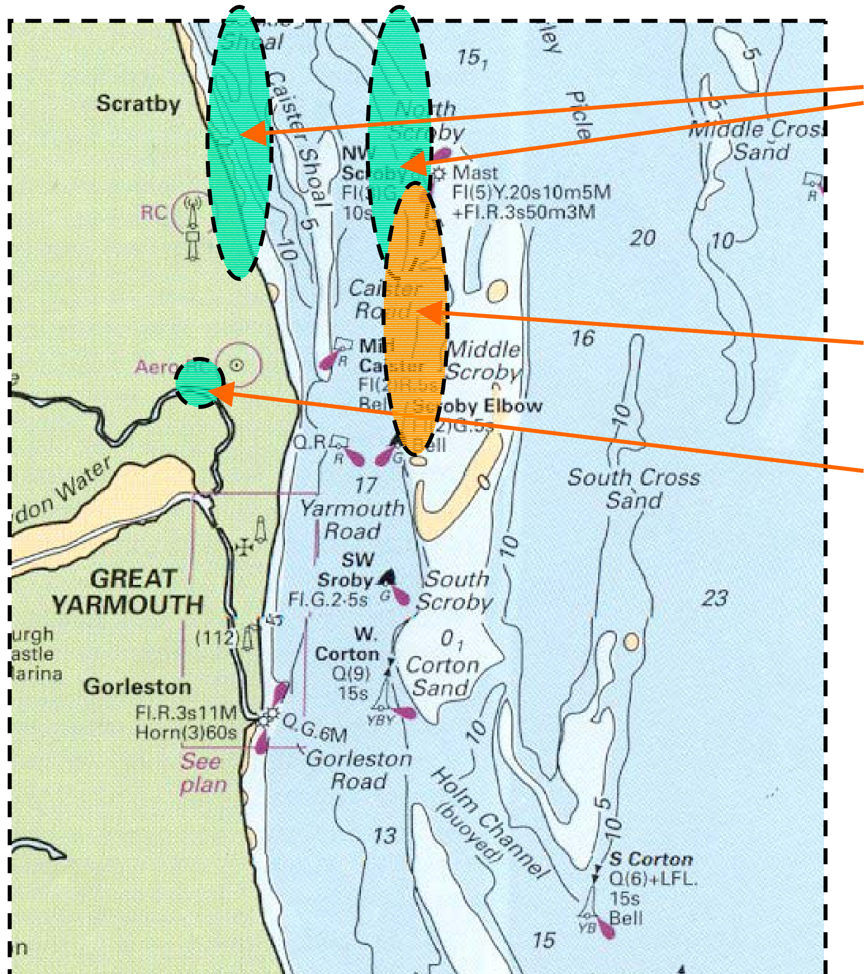
	Location	h_dep (m)	h_mod (m)	H_dep (m)	H_mod (m)	
					Refrac	PK
P1	Inshore	17.221	9.6	0.549	0.791	0.502
P2	Caister Rd.	22	15.58	0.744	0.986	0.589
P3	Scroby Sands	7.21	2.03	1.060	0.880	0.884
P4	Offshore	19.417	16.51	1.013	1.013	1.013

Tidal range experiments

Hs : 2 m, Ts : 8 sec, h : M.S.L



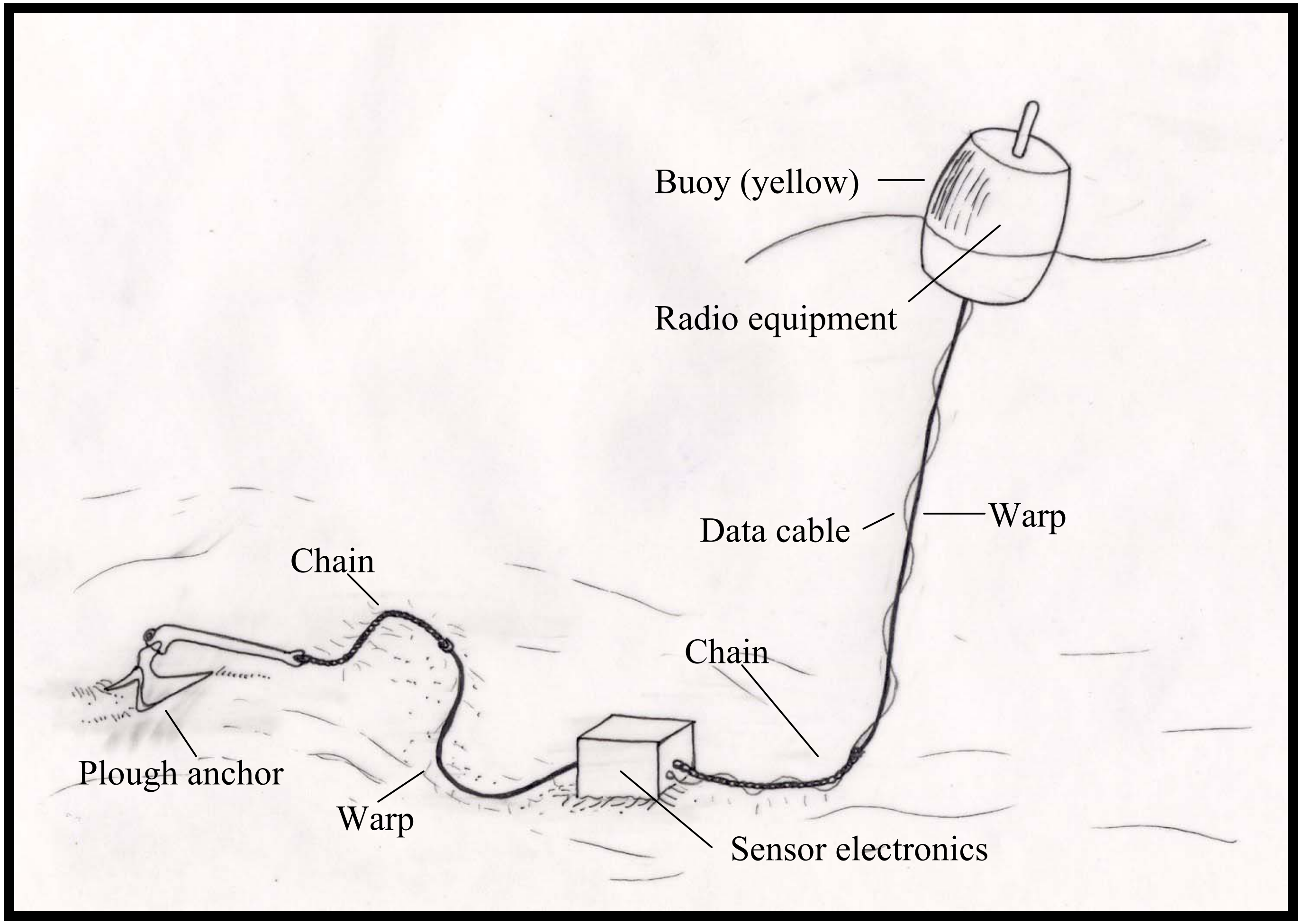
Initial Deployment Areas



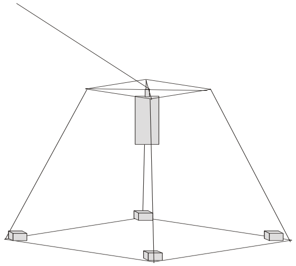
Deployment

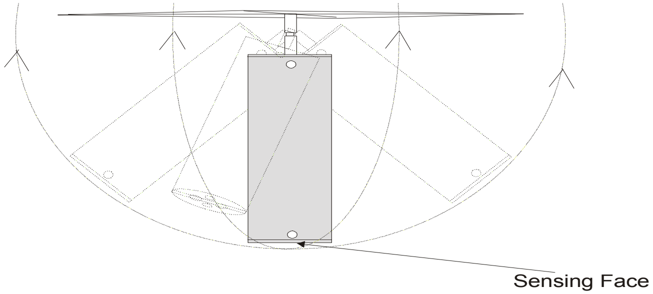
- Outside navigation channels
- Preferred water depth: 4 to 8m (at mean sea level)
- Node spacing 500m-1km
- 6 nodes in 2004
- 50 nodes in 2005
- Measuring Pressure, Temperature, Conductivity, Current, Turbidity
- Also need Location, Time, Power usage, self-test Diagnostics

Mechanical General Arrangement



Current sensing





Peak district Experiments

Radio Network

- Radio-Network integration in progress
  - Basic design – 10kbit/s @174MHz
    - Range >> 1km for 100mW Tx in calm sea
    - Range > 500 m in moderate sea
  - MAC and framing drafted (128 bit fixed length packets)
  - Timing issues addressed
- Proprietary addressless routing
- Broadcast, gossip (store & forward anycast), Unicast (ack, unreliable delivery – cf DCCP)

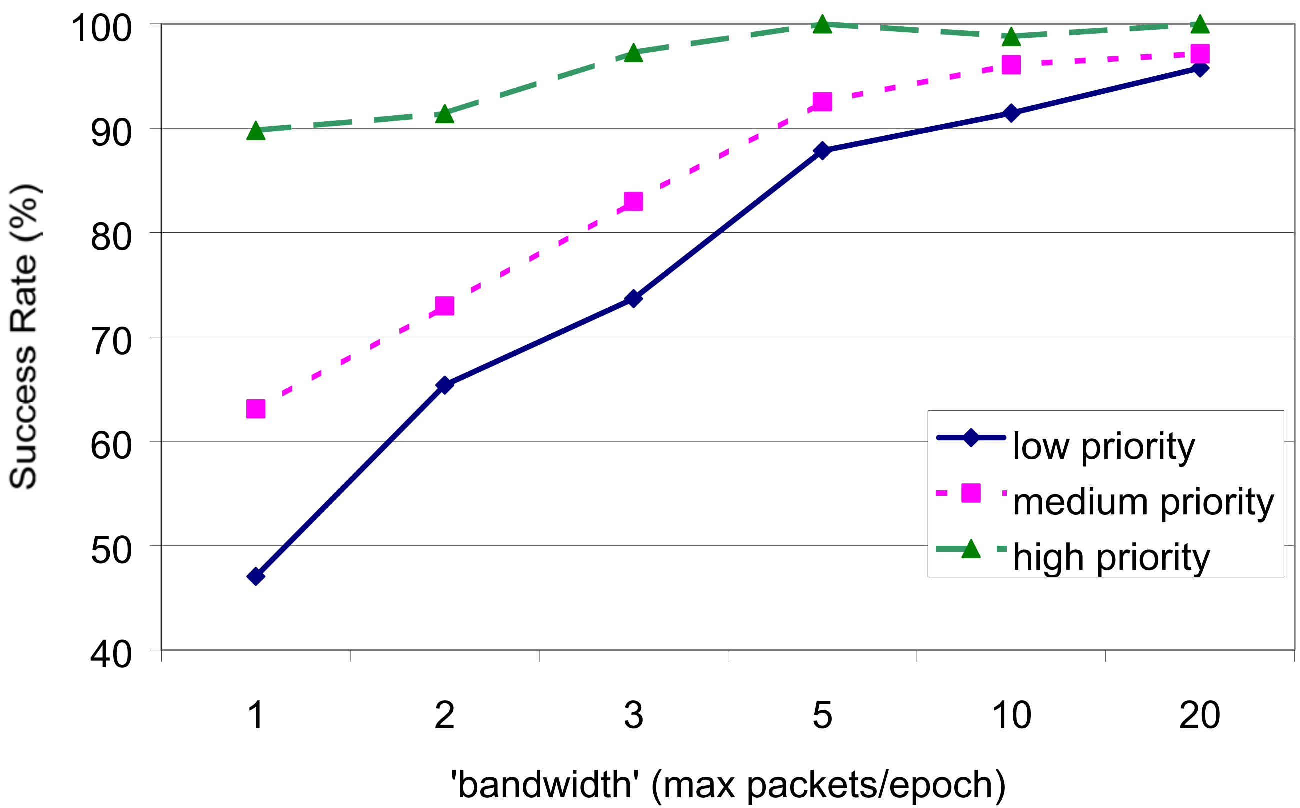
Auto-location

- In 2004 locates surface bouy
- Buoys have GPS
- Forwarding nodes save power by turning GPS off
  - Calculate position by lateration (RSS)
- In 2005 locates seabed package
  - Sonar pings
  - Dispersion based relative position
  - Intermittent (ship noise)

Adaptive sampling

- Measure, delete, combine, forward, sleep
- Use local variability and neighbour variability
- Self configure using distributed evolutionary algorithm
- Can adjust priorities and frequency of actions
- Can form groups (quorum sensing)
- Reward set by user using a gossip protocol – changes drive auto-reconfiguration of genome

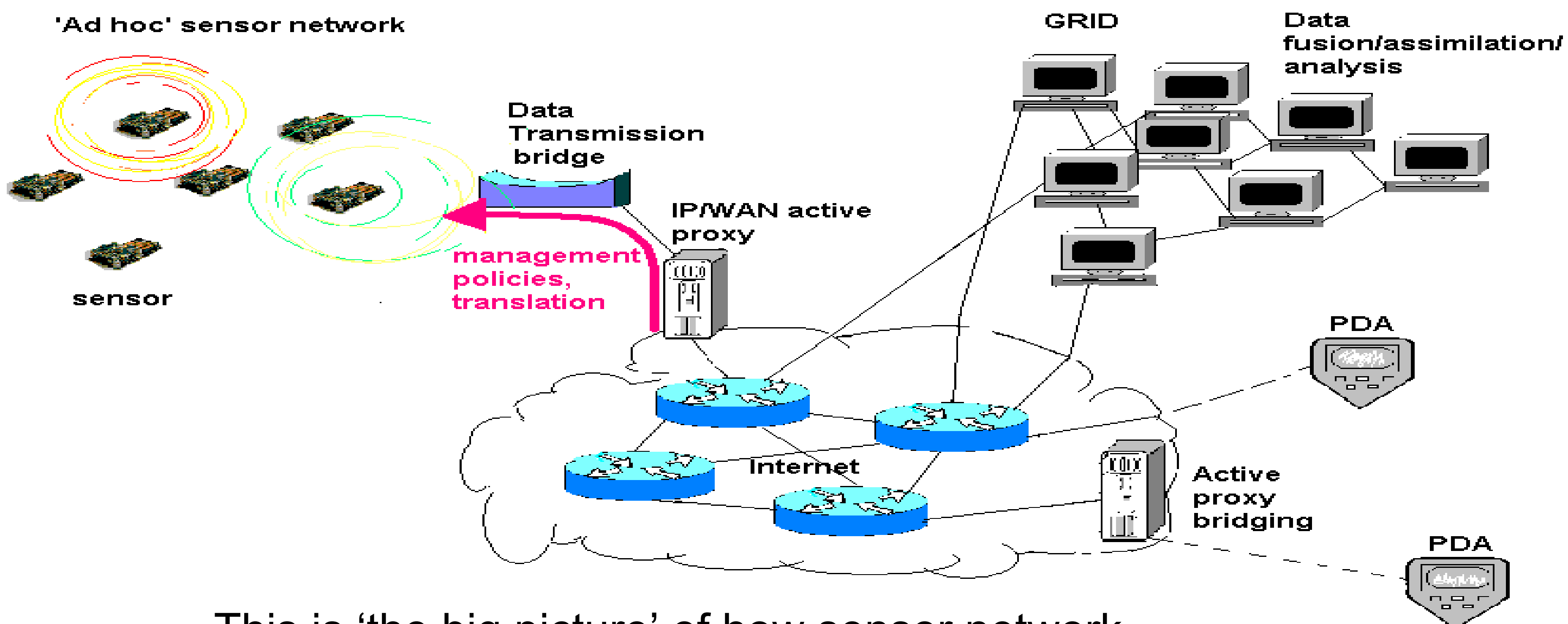
QoS on a Sensor Network



Summary

- Research is ongoing
- www.secoas.og
- www.envisense.org
- www.nextwave.org.uk

System architecture



This is 'the big picture' of how sensor network technology would be integrated into other areas of information technology, to provide users with timely, relevant *information*.