

## Nortek Technical Seminar

# Hebrides Marine Research Centre

Wave measurements at an ocean energy site

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An Overview of work by Lews Castle College (LCC)

### HEB MARINE Project

- use of AWACs for west of Hebrides wave energy resource assessment

### MERIKA Project

- Butt of Lewis Sensor Testing Facility
- Hebridean Beach Geomorphology



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# Hebridean Marine Energy Futures

## Objectives of the “Heb Marine” Project

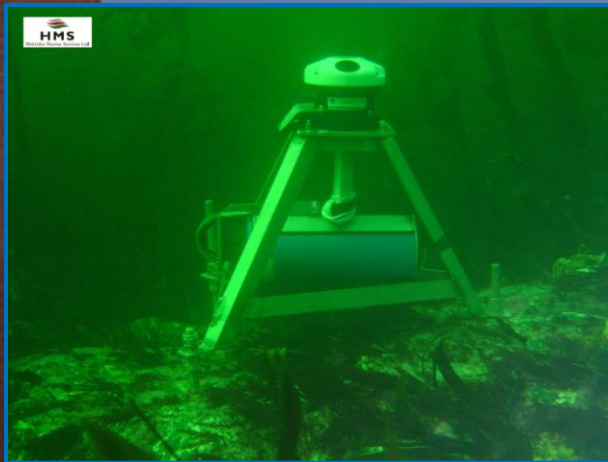
- To obtain long term wave data sets from high energy sites off the west coast of Lewis
- To develop the **Hebridean Wave Model** – for wave resource assessment and a tool to study environmental and ecological effects

## Activities & Outcomes of the “Heb Marine” Project

- 2 AWACs deployed - 700m off shore in water depths of 13.5m
- 3 wave buoys deployed - 15km off shore at 60m depth
- Data made available to project commercial partners;
- **Aquamarine and Pelamis**

# Long Term AWAC Deployment

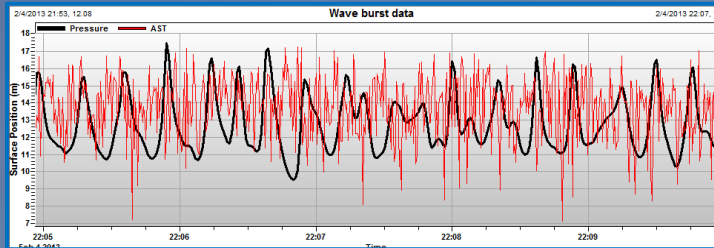
- Two 1MHz Nortek AWACs deployed off Bragar on Lewis (Loc 3)
- Resource assessment;  $H_{m0}$ ,  $T_p$ , direction and spread
- Mounted on custom made tripods, bolted into rock on the sea bed – to ensure survivability
- Successful deployments - data sets collected for 12 and 24 month periods - returns > 99%



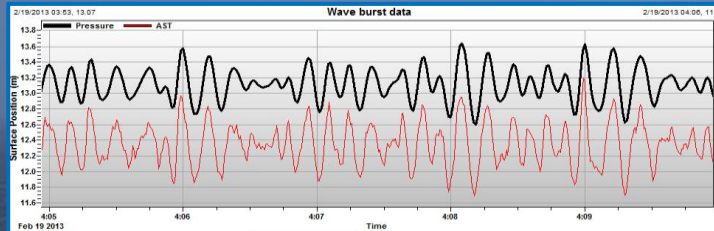
# AWAC Settings and Data Quality

- Settings to maximise battery life; waves @ 2Hz, 2048s per hour, plus two 60s current bursts

## Some Data Quality Issues



- AST proved to be unreliable in storm conditions - due to aeration?



- Pressure sensor indicated greater depth than AST - due to breaking waves or low atmospheric pressure?

Deployment Planning software interface showing various settings for wave processing. Key settings include: Profile interval (600s), Number of cells (10), Cell size (2m), Frequency (1 MHz), Number of samples (2048), Sampling rate (1 Hz), Interval (3600s), and Estimated depth (13m). The interface also shows deployment planning details such as Battery pack (2\* Lithium), Battery capacity (3200 Wh), Assumed duration (180 days), and Power level (HIGH).

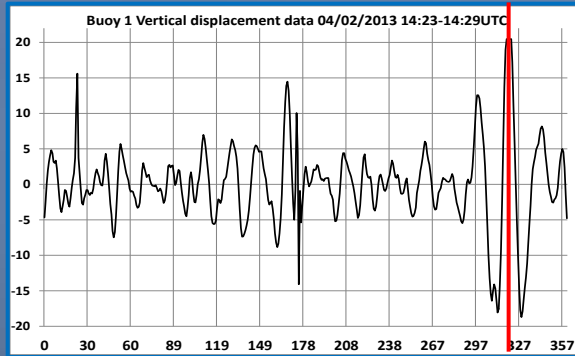
- PUV mode used rather than AST plus returns from 3 slanted beams - spectral information only
- OK for resource assessment, but not adequate for work now planned by LCC

# Wave Buoy Deployment and Data Quality

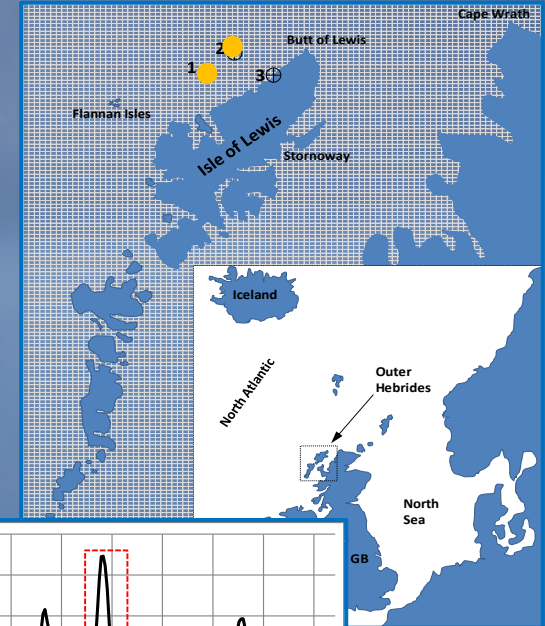
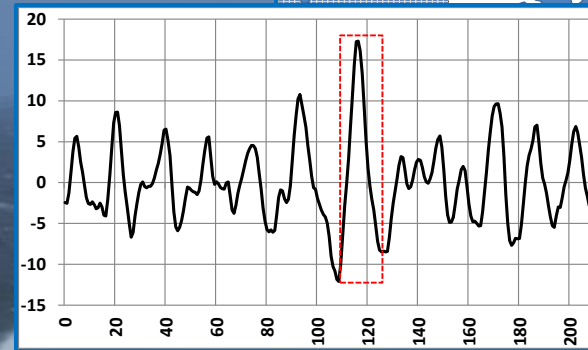
- Two Datawell Wave rider buoys deployed to west of Lewis (Loc 1&2)

## Again, some Data Quality Issues

- Spurious displacement data - has Datawell processing has rightly applied a filter at T=320?



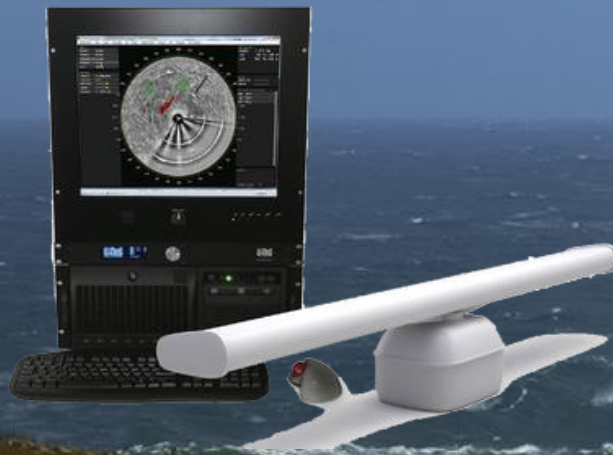
- A reliable displacement? – here no filter has been applied at T=118



# Going Forward...

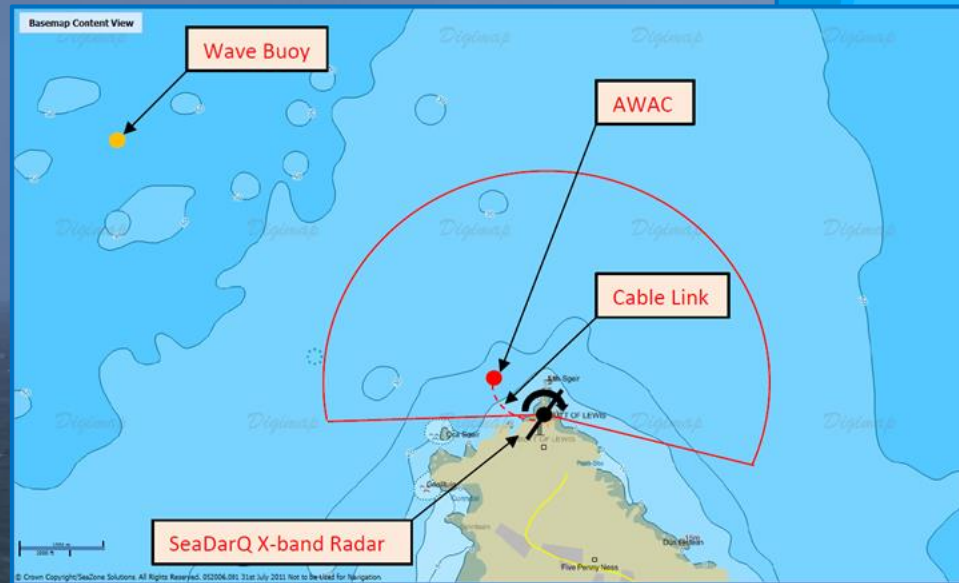
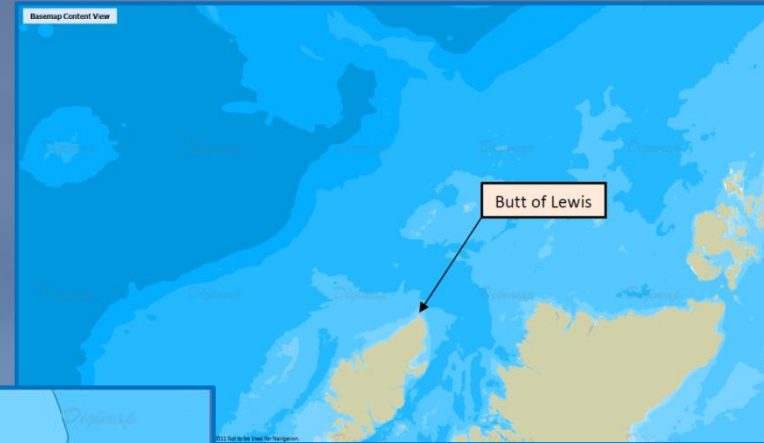
Wave resource assessment no longer central to LCC work, instead...

- Comparison of different types of sensors
- Data quality and analysis techniques
- High resolution measurements for study of conditions which drive sediment transport and of wave current interactions
- Deployment of alongside other types of instruments, eg SeaDarQ X-band radar



# A - Butt of Lewis Sensor Testing Facility

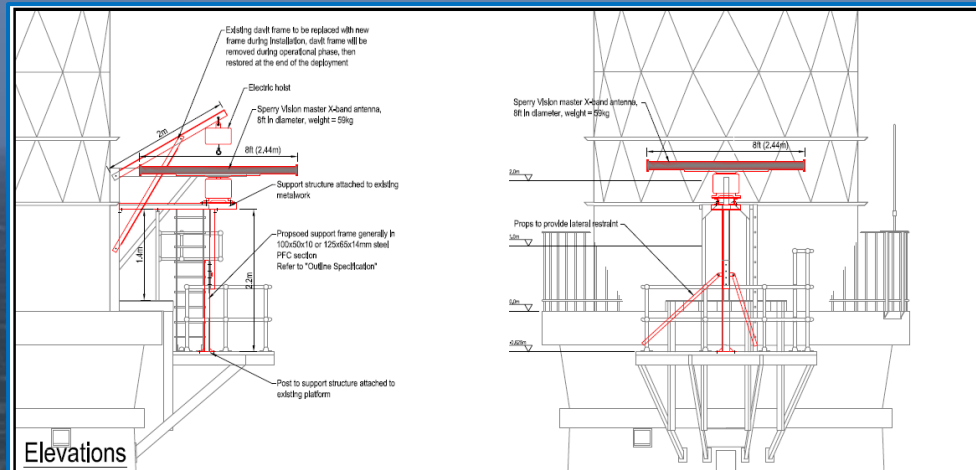
- Exposed location with long North Atlantic fetch
- Deploy SeaDarQ X-band radar, antenna mounted high on the Lighthouse as shown



- Deploy AWAC, hard wired to shore station
- Deploy Waverider Buoy, radio link to shore station, if possible within radar range

# Butt of Lewis Challenges

- Exposed Location
- AWAC at 35m depth, reduced dive time at seabed for installation
- Antenna installation – safe systems of work!?
- Consents and licencing for X-band radar antenna



# B - Hebridean Beach Geomorphology



- Initial focus on three west Lewis beaches with considerable seasonal variation



- Monthly GPS surveys of foreshore

- To be supplemented by short deployments of the Signature 1000 AD2CP, deployed in bed at low water
- Also, ADCP and Waverider Buoy, funding dependent

# Nortek Technical Seminar

## LEWS CASTLE COLLEGE UHI

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Thank you

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Marine Energy Research Innovation  
and Knowledge Accelerator

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