A Seafloor CSEM and MT Instrument

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A seafloor electromagnetic recorder

4 (8) Channels of data
24 bit ADC
90 GB (5 GB) data capacity
Power < 500 mW
Battery endurance 60 days
Maximum sample rate 1 kHz
E-field noise $10^{-20} \text{ (V/m)}^2/\text{Hz at 1 Hz}$
B-field noise $10^{-8} \text{ nT}^2/\text{Hz at 1 Hz}$
E-field sensor system

E/B-field Chopper Amplifier

2 kHz Oscillator

AC amp.

low-freq. amp.

synchronous detector

to ADC

to electrode

to electrode

1:50

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Frequency, Hz
Phase, °
Gain
line = theoretical calibration curve
= experimentally measured response
10^6
10^5
10^4
10^3
10^2

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Voltage Signals and Noise

![Graph showing various noise components at different frequencies.](graph.png)

- Seafloor MT signal on 10 m dipole, 1000 m water
- Instrument Noise
- Wave Noise
- Response [noise]
- Johnson Noise Limit

**Power, V^2/Hz**

**Frequency, Hz**
Induction coils:
SIO coils noisier than BF-4 above 1 Hz:
Current generation of logger:

- E/B amps
- 8 chan. 24 bit ADC
- Compass/tiltmeter
- Memory card
- Clock
Edgetech/EG&G burnwire element:
Instrumented strayline:
Magnetotelluric data:

Sites t03, t38 and t51 from GoM 2003: 15 minutes at 32 Hz sampling
Noise in magnetics:

GoM 2003: Noise in magnetics

Time (HH:MM) on 01/12/03

Ey

Hx

Hy

Ex

Ey

Hx

Hy

Ex

Ey

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Scripps Undersea Electromagnetic Source Instrument:
East Pacific Rise, 2004: 69 MT sites, 1000 receiver-hours of CSEM
CSEM data:

2 Hz Transmitter signal on EPR 2004

Time (HH:MM) on 02/29/04
CSEM data:

S40D slow fourier txfm at 2Hz

E field, V/Am^2

UTC Julian Date

Phase, degrees

UTC Julian Date
Summary:

A versatile, reliable, low-noise, low power, E/B recorder

About 100 have been built

≈ 1500 deployments, loss rate <1%, data recovery rate >95%

Useful for MT, CSEM, ASW