Seismic-While-Drilling Pilot Sensor

Description

LDEO/BRG has designed, manufactured and deployed a three-axis Seismic-While-Drilling (SWD) pilot sensor that is rigidly fastened on the drill string below the top drive. The pilot sensor is capable of acquiring drill string vibration data for 60-72 hours without interfering with normal rig floor operations. Data is telemetered in real time to the Downhole Measurements Lab using wireless technology. The enclosed accelerometer measures drill string movements up to 460 Hz, although only the frequencies between 0.1 Hz and 50 Hz are used for analysis. Data analyzed from two sites in the Indian Ocean have revealed possible correlations between drill string vibration signal and porosity logs. Physical properties of the drilled rock may be inferred in real time, even in the absence of core and log data. The unit can be adapted to acquire high-resolution drill string heave data.

The pilot sensor deployed on the *JOIDES Resolution* during Leg 179. The sensor is rigidly clamped in place using wedge style clamps.

Applications

- Seismic-While-Drilling (i.e., reverse VSP)
- Detection of gross scale boundaries in real time
- Measurement of ship heave

Specifications

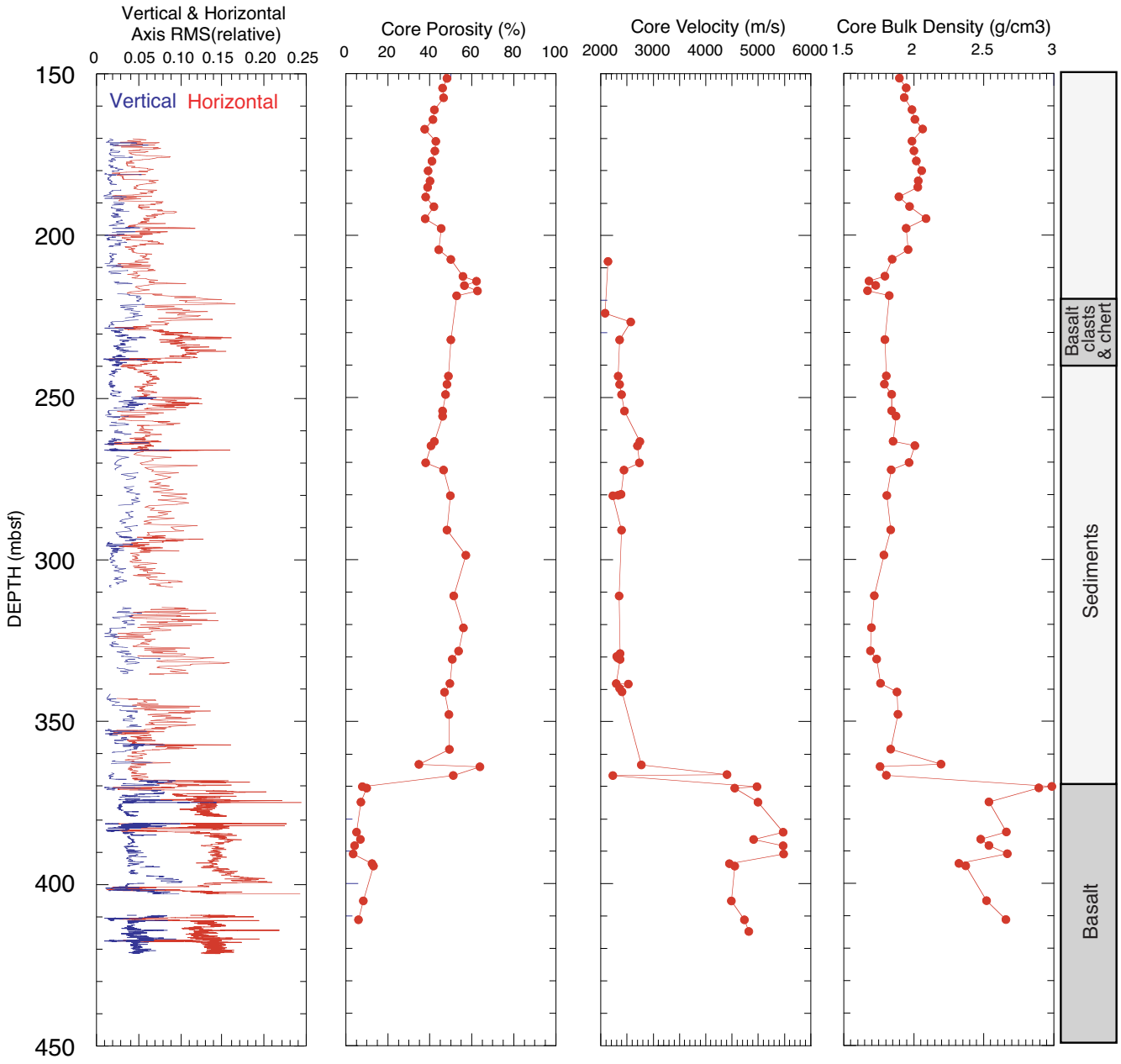
Data Transmission	
Frequency:	902 - 928 MHz
Transmission rate:	115 Kbaud
Output power:	1W (+30 dBm)
Sampling rate:	400 Hz

The pilot sensor electronic package contains a 3-axis accelerometer, wireless modem, PC board and batteries.

Accelerometer	
Sensitivity:	~850 mV/g
Measurement range:	+/- 2.5g
Upper Cutoff Frequency:	460 Hz (-3 dB)
Signal Processing	
Number of channels:	3
Frequency bandwidth:	0.6 - 50 Hz
Programmable Gain Amplifier 1:	0 - 18 dB, 6 dB step
Programmable Gain Amplifier 2:	0 - 60 dB, 20 dB step
AD Conversion:	16 bits
ADC dynamic range:	96 dB
ADC SNR:	86 dB
Physical	
Drill pipe diameter:	8 in.
Weight:	~100 lbs.
Height:	~36 in.
Diameter:	~20 in.
Clamp:	bronze wedge clamps

OCEAN DRILLING PROGRAM

ODP Logging Services, Lamont-Doherty Earth Observatory, Rt. 9W, Palisades, NY 10964



Pilot sensor vertical and horizontal axis RMS amplitude data from ODP Site 1107 with core measurements from adjacent Site 757. Pilot sensor data indicated the precise location of the basement in real time in the absence of core or log data. (Source: Myers *et. al.*, 1999)