SET

Sediment Temperature Tool

JOIDES Resolution Science Operator

Scientific Application

The SEdiment Temperature (SET) Tool is designed to take temperature measurements in sediments too consolidated to use the Advanced Piston Corer Temperature-3 (APCT-3) tool. The SET evolved from the Davis-Villinger Temperature Probe (DVTP), named for its creators. The old DVTP name is still sometimes used for the new SET tool.

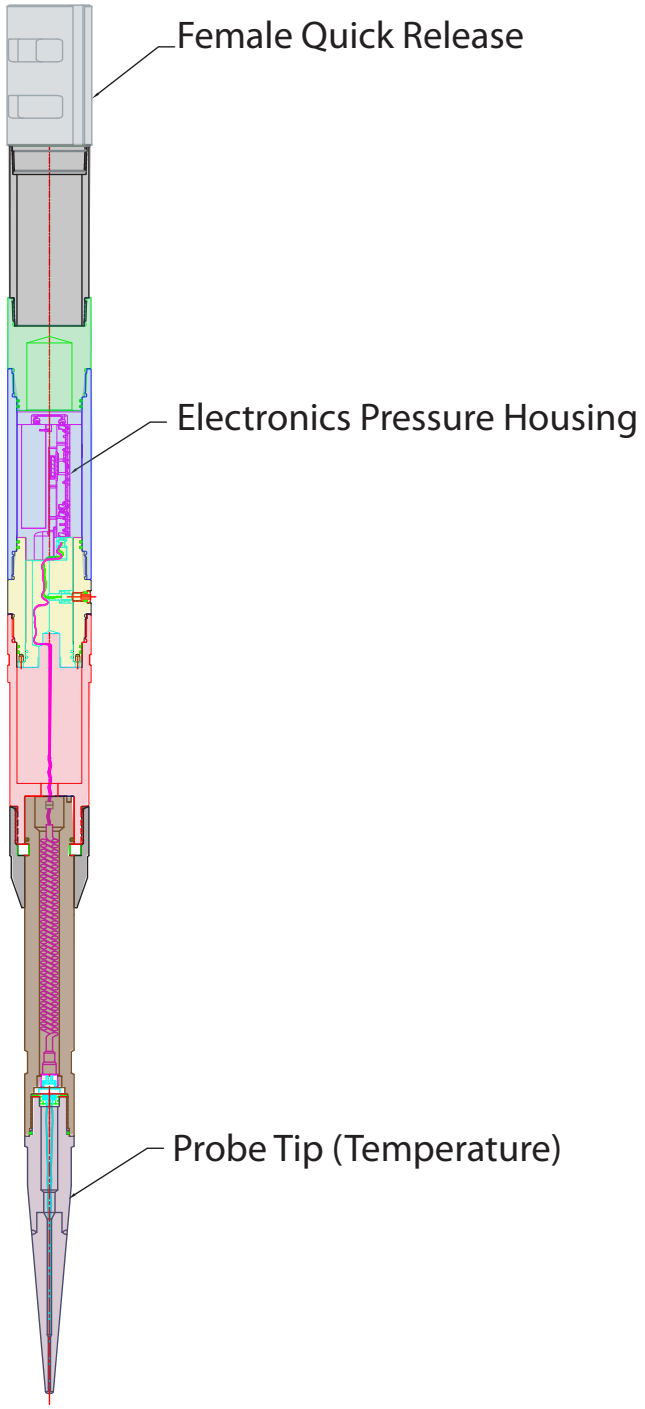
Operation

The SET is wireline deployed using the Colleted Delivery System (CDS). The CDS allows the SET to decouple from the drill string and provides a feature to prevent damage to the tool during sediment penetration. After the driller picks the drill string up off the bottom ~5 m, the CDS/SET is placed in the drill pipe and run downhole, where it lands and latches into the Bottom-Hole assembly (BHA). The SET extends 4.4 m beyond the bit prior to insertion into the sediments at the bottom of the hole. The driller slowly lowers the drill string while the CDS/SET retracts 3.3 m into the BHA, at which point the probe begins taking load as it penetrates the formation. The smooth tapered probe tip is designed to create a seal against the sediments as it is pushed in so that in situ temperature measurements can be recorded. Typical recording time for the tool in sediment is 20 min. After temperature measurements are recorded, the tool is retrieved by wireline and the SET is moved to the laboratory for data download.

Features

Compatibility

The tool latches into either the Advanced Piston Corer/Extended Core Barrel (APC/XCB) or Rotary Core Barrel (RCB) BHA, increasing usability.



Schematic of the SET tool.

Decoupled from Heave

The SET is deployed on the Colleted Delivery System, which allows the probe to be disengaged from the BHA after it is pushed into the sediments. This minimizes the effect of drill string movement (from ship heave) on the probe's temperature measurement.

Data Recording

The tool is capable of storing three channels of analog data at 1 Hz and one digital input of acceleration data at 10Hz for 45 hr. This provides sufficient measurement detail and recording time to assure good quality data.

Specifications

Temperature Measurements:

Analog thermistor data

Range: 0° to 110°C

Resolution:

—0.002°C below 20°C

—better than 0.005°C below 60°C

—0.0025°C at 100°C

Acceleration Measurements:

1 digital 3-axis acceleration sensor

Range: ±2g

Resolution: 0.01g

Frequency: 10 Hz

Communications

Standard 3-wire RS-232 serial link

Data Storage

45 hr of data on 128Mb flash memory card

Physical Dimensions

Probe Tip: Conical, continuously tapered at 2.5° from 55.5 to 8 mm in diameter

Tool: 82 cm long, 6.7 cm ID

SET tool Probe Tip.

Operating Range

Formation

Soft to semi-consolidated sediments (e.g., chalks or firm clays)

Temperature Range

-20°C to 75°C

Maximum Depth

7000 m (equivalent to ~10,000 psi)

Limitations

Not used in hard rock (e.g., chert, dolomite, limestone, or basalt)