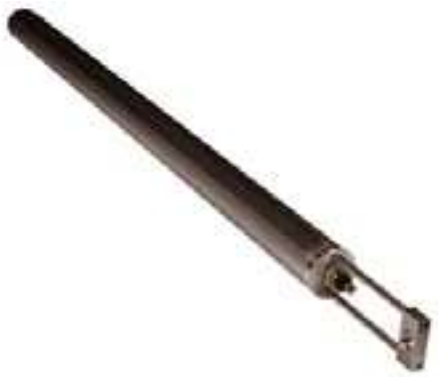
Jewell Instruments

Ocean Bottom Tiltmeters for Geophysical Research

- **Objectives:** Observe sea floor long-term
- **Solution:** Jewell Model 510 Geodetic Borehole Tiltmeter
- **Benefits:** High-precision and long-term durability
- **Results:** Continuous and accurate data collection

Overview

The Carnegie Institution of Washington installed two Jewell Instruments Model 510 Geodetic Borehole Tiltmeters (now referred to as Lily 500 Series Tiltmeters) in the sea floor East of Japan. Scientists are attempting to establish long-term sea floor observatories in one of the world's most active earthquake zones. Each observatory contains a Jewell Model 510 Geodetic Borehole Tiltmeter, Sacks-Everston Borehole Strainmeter, two seismometers, and a temperature sensor. Installation was performed from the JOIDES Resolution research vessel as part of the Deep-Sea Drilling Project.



Jewell Model 510 Geodetic Borehole Tiltmeter

Project

The deep boreholes are located about 150 km off the east coast of Japan in a region known as the Japan Trench. It is critical to record earthquakes and the Earth's movement for study of the dynamic process of tectonic collision. The Model 510s were chosen for the purpose of monitoring crustal deformation. At this site, the Pacific Plate is colliding with and sliding under the Eurasian Plate in a process referred to as subduction. Subduction zones are the locations on Earth where the largest and most destructive earthquakes occur.

As plates collide, they can lock and accumulate stress that is released quickly in the form of earthquakes (seismic deformation). Creeping motion (aseismic deformation) may also occur where the plates slowly collide. Monitoring the seismic and aseismic deformation over an extended period of time will enable scientists to understand how and when strain is released at the Japan Trench. These data will be used to help establish predictive

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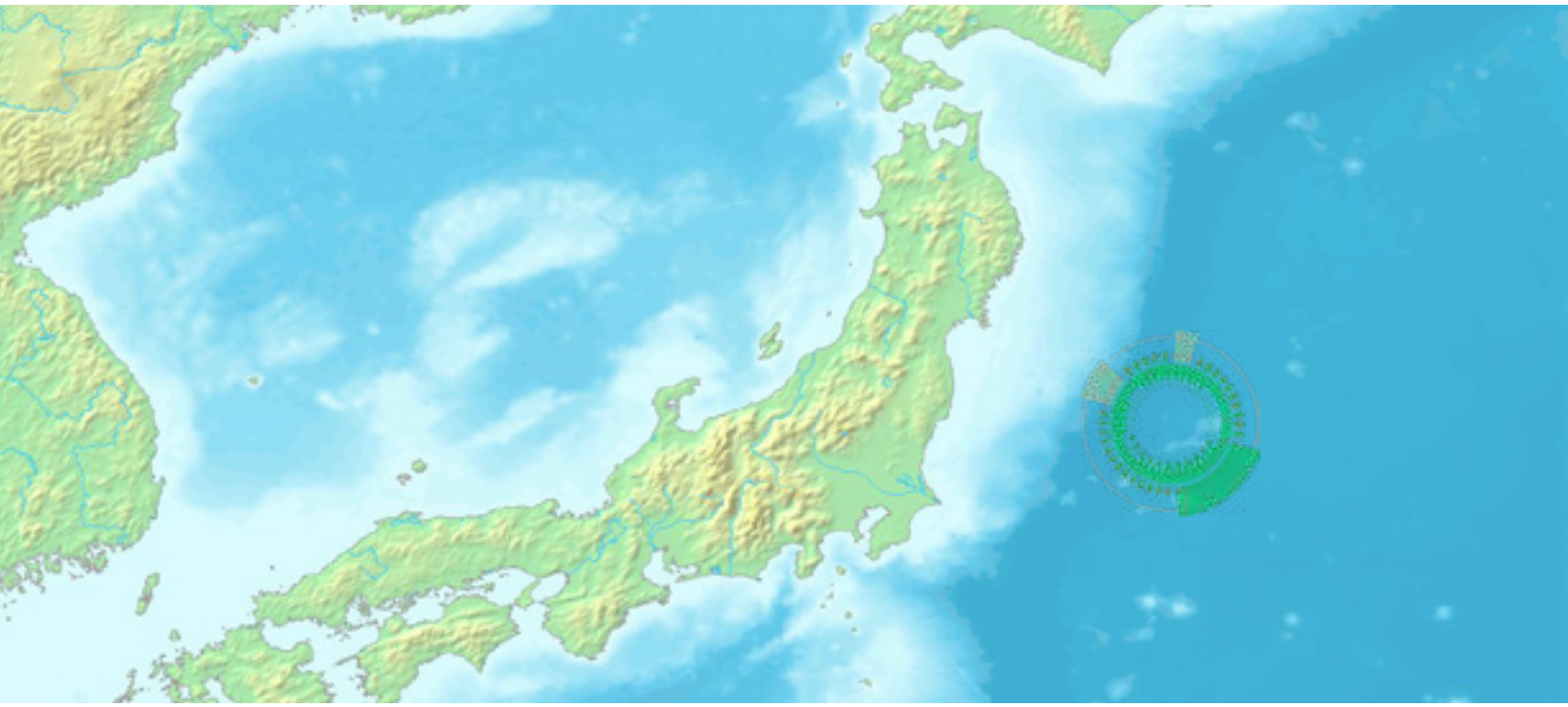
measures to prevent loss of life and damage to cities.

In 2006 Jewell Instruments introduced the LILY 500 Series self-leveling tiltmeter, and it is now used in a wide variety of tectonic, volcanologic and ocean bottom studies. Using a high-precision electrolytic tilt sensor, the digital LILY tiltmeter offers a range of firmware-controlled data acquisition and data storage features that make it especially useful for geophysical applications Using a high-precision electrolytic tilt sensor, the LILY 500 Series delivers resolutions to 5 nano radians; the dynamic range is ±330 μradians. Units also feature a ±10 deg. leveling range for easy installation downhole. Output is RS-232 or RS-422 (RS-485 full-duplex) and includes timestamp and compass bearing. Data can be saved to file externally or to LILY's on-board flash memory (75,000 sample max) using fill/stop or cyclic memory modes.

Units are fully submersible to 3000 psi. Titanium is also available for +5000 psi applications. The culmination of over 30 years of tilt sensor experience and expertise, the LILY represents the pinnacle in precision sensor engineering.



Further Details

For more information about this program, contact Dr. I. Selwyn Sacks of the Department of Terrestrial Magnetism at the Carnegie Institution of Washington, D.C., USA ;sacks@dtm.ciw.edu. 202-686- 4370, ext 4388.

Dr. Kiyoshi Suyehiro with the Japan Marine Science and Technology Center suyehiro@jamstec.go.jp, 81-467-67-3827. Dr. Sacks and Dr. Suyehiro are the co-chief scientists for this expedition.

About Jewell Instruments

Jewell Instruments is a world leader in the design, manufacture, and distribution of high-precision products. Our expertise includes acceleration and tilt sensors, electronic compasses, avionics components, solenoids, and panel meters. The extensive application knowledge we have obtained through decades of experience allows us to provide custom solutions for a diverse group of industries. In fact, customers from all over the globe contact us for solutions to aerospace, medical, industrial, and telecommunications applications - to name a few.

To find out more, visit our website!

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