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Performance evaluation of a laser-interferometric broadband seismometer for observations in extreme environments

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We have developed a Laser-interferometric broadband seismometer for observations in extreme environments.

As such environments, the seafloor (ocean bottom borehole) and the planet (Mars investigation etc.) are so important sites from the viewpoint of seismology.

The seismic observation in ocean bottom boreholes in subduction zones is a critical way to get better comprehension of earthquake generation process and the prediction.

Also, the seismic observation on a planet (earthquakes, free oscillation) is so effective way to reveal its internal structure.

To perform valuable observations for such purpose, many superior specifications are simultaneously required for the seismometer, such as high sensitivity, broadband, maintenance-free, robustness, low noise, compact size (borehole/hand size), durability in high/low temperature, and radiation durability (cosmic ray).

As there are no seismometers on the market that have these specs, we have originally developed a laser-interferometric type broadband seismometer.

This seismometer consists of 3 sections: a laser intereferometer, a long-term pendulum, and a feedback servo electronics.

Having passed through the vibration test and the temperature test, we have made the breadboard model of this seismometer.

In this presentation, we will mainly show the details of the self-noise test and the evaluation through the test observation at Nokogiriyama observatory.

Keywords: seismometer, broadband, borehole, planet, ocean, laser