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Development of a Laser-interferometric broadband seismometer for the observation in extreme environments

Teruhito Hori[1*], Akito Araya[1], Naoki Kobayashi[2], Hiroaki Shiraishi[2], Tatsuaki Okada[2], Takehiko Satoh[2], Hideaki Kakuma[3], Hideki Murakami[4]

[1]ERI, Univ. Tokyo, [2]ISAS/JAXA, [3]ADEP, [4]Kochi Univ.

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.
Until now, we have made each elements and performed the vibration test, temperature test, for the confirmation of the durability.

In this presentation, we will show the details of these performance tests, the entire structure of the seismometer, and the prospects for the development.

Keywords: broadband seismometer, laser, ocean bottom borehole, planet investigation, extreme environment, free oscillation