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LUNAR SEISMOMETERS: PAST, PRESENT AND FUTURE

Abstract

The history of lunar seismometers began over fifty years ago, when the first lunar seismometers were deployed during the Apollo missions. The very fruitful harvest of information associated with these deployments has led to a better understanding of the structure of our natural satellite.
However, the location of these seismometers, on the visible surface and at moderate latitudes, as well as their relatively low bandwidth, leaves a number of uncertainties, on the Moon's internal composition for example.
This is why NASA has selected the Farside Seismic Suite (FSS) instrument, as part of its Commercial Lunar Payload Services (CLPS) program. It is due to land in 2026 in the Schrödinger crater on the far side of the Moon, close to the South Pole. This instrument, developed by JPL, has at its heart a VBB (Very Broad Band) seismometer from the successful INSIGHT program, which operated successfully for 4 years on Mars, and is supplied by IPGP (Institut de Physique du Globe de Paris) and CNES (Centre National d'Etudes Spatiales). In addition to improving our knowledge of the Moon's internal structure, FSS could be used to characterize the crust in the region concerned, measure the impact rate of mete-

orites, and assess the local seismic level. These last two capabilities are of great interest in the run-up to the ARTEMIS missions, which will deposit astronauts in the same region.
But in order to meet the target objectives of a future lunar geophysical network, it is necessary to develop new-generation seismometers, with enhanced performance compared with the VBB seismometer.
We have therefore begun development of an optical seismometer. The seismometer is still based on a mechanical pendulum, but, unlike the VBB seismometer, whose pendulum displacements are measured by a capacitive sensor, these will be measured by a Michelson interferometer.

The paper will mainly present the evolution of lunar seismometers, from the seismometers used in the Apollo program, to future optical seismometers, which could be deployed as part of future lunar geophysical networks.