INTERNATIONAL SPACE SCIENCE INSTITUTE

Statement of ISSI international team on Moon seismology

The Passive Seismic Experiment, which was deployed during the Apollo missions, was the only seismic network on a terrestrial body other than Earth. Forty years after the experiment was shutdown, outstanding questions on the internal structure of the Moon remain unsolved. Our review, performed during the first meeting of our ISSI team in Bern, demonstrates that both the deep internal structure and the crustal structure of Moon are still debated. The consequent uncertainties on these fundamental parameters leave many open questions on the formation and evolution of the Earth-Moon system.

The data from the Apollo Lunar Surface Experiment Package are a unique legacy. These geophysical measurements covered passive seismic, active seismic, gravimeter and heat flow experiments. The ISSI team want to reiterate the importance of recovering all of these data. In addition, proper archiving of all data and meta-data on modern data formats is necessary to increase the efficiency of their distribution within the scientific community. We therefore urge NASA and IRIS-DMC to support these efforts by all possible means.

However, many lunar science questions will never be solved through the Apollo legacy alone. The ISSI team is therefore supporting all future missions designed to deploy seismic sensors on the surface of the Moon.

Efforts in many countries indicate that an International Lunar Network of seismic stations could be deployed on the Moon by the mid 2020s. In Japan, there is a mission project to deploy one or more seismic penetrators. In China, there is the continuation of the China Lunar exploration program after Chang'e 6. In the USA, the Lunar Geophysical Network is one of the possible candidates for the New Frontiers 5 mission.

These space mission projects are supported by the availability of various space-qualified seismometers which are more sensitive (within their bandwidth) than the Apollo seismometers. Among these instruments, the ones developed in the framework of InSight, Lunar-A and APPROACH have a high technical-readiness level. Further improvements are also possible, building on the research and development work of several laboratories worldwide.

For planetary seismology, it is not only the right time to return to the Moon, but also mandatory to elucidate the critical science questions on the origin and evolution of the Earth-Moon system.

Space Science Institute International team "An international reference for seismological data sets and internal structure models of the Moon"

Raphael F. Garcia and Peimin Zhu
for the ISSI international team