

Hong Kong scientists make great strides in lunar mapping

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The resulting lunar mapping is the hard work of a dedicated research team led by Professor Chen Yong-qi, Emeritus Professor of the Department of Land Surveying and Geo-Informatics (LSGI), who is also serving on the Expert Committee of China's Lunar Exploration Programme, with the concerted efforts of team members Prof. Chen Wu, Prof. Ding Xiao-li, Prof. Baki Iz, Dr. Bruce King, and Dr. Wu Bo.

According to Professor Chen, the lunar mapping project started in 2006. The primary objective was to develop the methodologies and techniques for mapping the Moon surface, which is much more challenging than mapping the Earth's surface because of very few surveyed control points – which are essential for accurate map making.

There are only fourteen lunar laser ranging retro reflectors (LRRR) and Apollo lunar surface experiment package (ALSEP) transmitter sites with accurately known coordinates available only on the near side of the

Moon, installed by the USA Apollo and former Soviet Union Luna missions in the 1960's. Moreover, the gravitational field of the Moon is not as well known as that of Earth, meaning the accuracy of the computed lunar satellite's position at any given time is lower than for Earth satellites; thus degrading the mapping accuracy and reliability. In addition, highly reflective lunar surface creates significant problems for the automatic processing of images to develop 3D models using the technique of photogrammetry, which is a widely used and highly reliable technique for the creation of maps and 3D models on Earth.

The PolyU team has made significant contributions to lunar mapping. Their efforts culminated in the development of a unique and innovative approach to the creation of accurate 3D models of the [lunar surface](#). This was achieved by integrating ChangE-1 digital imagery and laser altimeter data, a first in lunar mapping research. In collaboration with research centers on the Chinese Mainland and overseas they evaluated the digital elevation model (DEM) of the Moon derived from ChangE-1 laser altimeter data against those from previous data, including Japanese SELENE and USA Clementine missions.

The PolyU team has also produced the most updated parameters of the lunar figure (the shape of the moon), which is essential for lunar mapping using 17.5 million laser altimetry measurements from the ChangE-1 and the Japanese SELENE missions. They also used the new topographic and gravity models to calculate improved crustal thickness and mass distribution of the Moon and established that the average thickness of the Moon's crust is about 40 km on the near side and 50 km on the far side.

Since Professor Chen Yong-qi is serving on the Expert Committee of [China's Lunar Exploration](#) Programme, the team has direct access to more recent data captured by the ChangE satellite. It is also a plan of the team to compare such data with other data sources in order to evaluate

the performance of the ChangE mapping sensors.

Provided by Hong Kong Polytechnic University

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