[P-61] Orbit Determination Performance Analysis according to the Ground Tracking Support Condition in Trans-Lunar Orbit for Korea Pathfinder Lunar Orbiter

Jonghee Bae, Young-Joo Song, Young-Rok Kim, SeungBum Hong, Jun Bang, Jae-ik Park

Korea Aerospace Research Institute

KPLO (Korea Pathfinder Lunar Orbiter) will be launched and fly to the Moon along the WSB/BLT (Weak Stability Boundary/ Ballistic Lunar Transfer) trajectory in the middle of 2022. During the trans-lunar cruise phase, the farthest distance from the ground station to KPLO is more than one million km. For the nominal operation, FDS (Flight Dynamics Subsystem) of KPLO estimates the trans-lunar trajectory using two DSN (deep space network) and KDSA (Korea Deep Space Antenna).
The ground tracking support has a significant impact on the navigation performance of spacecraft. Therefore, this study analyzes the orbit determination performance of KPLO considering the ground tracking support condition in the trans-lunar trajectory. For orbit determination of KPLO, a sequential estimation algorithm is used in KPLO FDS, and the position uncertainty is analyzed to evaluate the orbit determination performance. In this study, the tracking failure case is considered in the nominal operation. From this study, the orbit determination performance in a tracking failure situation can be investigated. Moreover, the strategy can be established to improve the orbit determination performance.

[P-62] Opposite Trends of Optical Maturity in Northern and Southern Hemispheres on the Lunar Surface

Kilho Baek[1], Sungsoo S. Kim[1], Chae Kyung Sim[2]

[1]*Kyung Hee University*
[2]*Korea Astronomy and Space Science Institute*

The wall-quadrants of lunar craters are good tools for analyzing the optical maturity (OMAT) difference caused by the flux of space weathering agents such as solar wind particles and micro-meteorites. They had been exposed on the surface for the same duration and the walls facing each other have different incident angles of the aging agents depending on the location. In this study, we use the equator-facing (EF) and pole-facing (PF) walls of 26,802 craters to show the relative influence of the flux difference in latitude. We find that the OMAT difference between the EF and PF walls has opposite trend in the northern and southern hemispheres at lower latitude. Below 25 degrees, the EF wall is more mature than the PF wall in the northern hemisphere, but it is the opposite in the southern hemisphere. Unlike previously known, the hemispheres seem not to be symmetrically affected along the ecliptic plane. Similar trends are confirmed with wall slope and rock abundance estimated using Lunar Orbiter Laser Altimeter and Diviner data of the Lunar Reconnaissance Orbiter, respectively.

[P-63] Historical Footprints of Schedule Management for the Korea Pathfinder Lunar Orbiter (KPLO) Program in 2021

Jae-Hoon Song

Korea Aerospace Research Institute

In 2021, successive development has been accomplished in the Korea Pathfinder Lunar Orbiter (KPLO) Program after change of execution organization since November 2019. In this article, historical footprints of schedule management for the KPLO Program in 2021 are presented especially for the critical path of the KPLO Integrated Master Schedule (IMS).

[P-64] A Method to Improve the Solar Panel Rotating Angle Calculation Accuracy for KPLO

Hanwoong Ahn

Korea Aerospace Research Institute

The Korea Pathfinder Lunar Orbiter (KPLO) has two solar panels on either side. The solar array can always be directed toward the sun through rotation of solar panels by solar array drive assembly. The rotation angle of the solar panel is measured through a potentiometer of the solar array drive assembly. The potentiometers consist of a primary potentiometer and a redundant potentiometer, and are phase shifted by 180 degrees to each other so that the dead zone positions of the two potentiometers are not identical. In order to calculate the rotation angle of the solar panel from the potentiometers, it is necessary to define the alignment angle of the potentiometers, the dead zone of the potentiometers, the rotation direction of the solar panel, and the null position of the solar panel. This paper deals with a method to improve the accuracy of calculating the solar panel rotation angle from a potentiometer.

[P-65] An Analysis of Shackleton Crater as a Future Lunar Landing Site

Joohee Lee, DongYoung Rew, JooHyeon Kim

Korea Aerospace Research Institute

Recently, Shackleton Crater, located in the south polar region of the Moon, has been widely mentioned as a candidate area for future lunar lander missions and a candidate area for manned exploration landing missions. After the unmanned and manned moon exploration led by the United States and the former Soviet Union from the 1960s to the early 1970s, unmanned lunar exploration missions resumed in the late 1990s,