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CANDIDATE LANDING SITES AT THE SOUTH POLE OF THE MOON FOR THE LSAS
COMMERCIAL LANDER MISSION

Abstract

The south pole (SP) of the Moon is thought to bear crucial resources of interest for both science and in situ resource utilization (ISRU). Seven of the eight science concepts mentioned in the 2007 NRC report could be addressed at this location, including the analysis of lunar volatiles such as water ice in Permanently Shadowed Regions (PSRs).

OHB (Germany) and IAI (Israel) have been developing together the Lunar Surface Access Service (LSAS): a commercial lunar landing service targeting the lunar SP. The lander will support an 85kg payload including a seismometer to determine the lunar crust thickness, additional geophysical instruments and ISRU demonstrations.

This paper discusses candidate landing sites near the SP for the LSAS mission. Available remote sensing imagery for the lunar SP was downloaded from NASA's Planetary Data System or corresponding instruments' websites and added into a Geographic Information System (GIS). LSAS scientific objectives and technical specifications were then translated into a list of criteria and computed in our GIS.

Illumination is limited even in polar regions, yet it is required for long-term operations of some of the payloads (e.g., the seismometer). Therefore, we focus on the 56 SP locations from Mazarico et al. (2011) where average Sun visibility is > 80% of the time.

LSAS will have a high precision landing capability due to optical navigation. Therefore, a radial buffer of 50m was computed for the 56 points from Mazarico, to represent a 100x100m-diameter landing ellipse. Slopes should not exceed 10 within the ellipse, while the Sun and Earth shall remain visible in the horizon. For each ellipse, the following statistics were thus computed: slopes (LOLA 20m/px polar DEM), Sun Earth visibilities (LOLA 60m/px simulation of Mazarico). For each ellipse that is 100% compliant with the slope criterion, a score is calculated, considering: 70% of the mean Sun visibility + 30% of the mean

Earth visibility.

Best candidate landing ellipses with this scoring scheme are located on the connecting ridge (between Shackleton & De Gerlache), and on the Nobile ridge. Further work shall include a high-resolution analysis of the NAC mosaics (1m/px) and mini-RF data (118m/px) for hazard mapping, time-specific Earth and Sun visibilities computation and analyses of accessible PSRs and related temperature to assess possible volatile scouting near these sites.