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## Investigating Potential Safe Landing Sites for ESA/ROSCOSMOS' Luna 27 Mission

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ESA and ROSCOSMOS' Luna 27 mission will explore the south polar region of the Moon and will sample the lunar surface. To ensure the best samples are collected, which yield the greatest scientific return eight potential landing sites are being investigated using remote sensing methods. We have studied the safety of the eight potential landing sites by creating slope maps using the LOLA (30m/px) digital elevation model and classified slopes into safe areas (slopes  $<10^\circ$ ) and unsafe areas (slopes  $>10^\circ$ ). Additionally, we created slope maps classified in  $2^\circ$  intervals from  $0-14^\circ$  and greater than  $14^\circ$ , to further investigate which areas have the lowest slopes and therefore potentially the safest landing sites.

We found that each of the eight landing sites contain areas that are safe for landing (slopes  $<10^\circ$ ) and sites 1, 2, 4, 6 and 8 contain large areas ( $>500 \text{ km}^2$ ) that are classified as safe for landing. Site 3 has large craters with steep crater walls, which may present a hazard to landing. At site 5 there is a large crater ( $\sim 20 \text{ km}$  diameter) to the bottom right of the site, which has a steep crater walls and rim, which creates a topographic ridge in the south east of the landing site and should be avoided as a landing site. Site 7 also has a steep topographic ridge which again should be avoided as a landing area. In comparison site 8 contains a large area with shallow slopes in the center with slopes of  $0-2^\circ$ , which would be an ideal landing site. Site 1 covers a large crater ( $\sim 40 \text{ km}$  diameter), and the center of the crater floor has shallow slopes with less than  $4^\circ$ . Site 2 similarly has a large crater floor with slopes less than  $4^\circ$ . Both the crater floors of site 1 and site 2 could be a safe landing site.

This initial investigation into the potential landing sites has identified areas which could be safe for landing Luna 27. Future work will use multiple datasets to explore the scientific potential of the landing sites including investigating the surface roughness, identifying craters and boulders, which could present a hazard to the lander, using thermal maps to measure the thermal stability, and exploring the illumination conditions and Earth visibility at each of the landing sites.