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Site Selection and Automatically Calculated Rover Traverse for a Lunar Teleoperated Landing Mission

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With the recent interest for the Moon, and the plans from the ESA side to do a tele-operated mission from Earth or lunar orbit, it is important to target a well-defined location. One of the major topics to study on the Moon is the existence and availability of volatiles and ices. Because no lander ever visited one of the poles on the Moon the theories with respect to water ice are only based on data from orbiters.

In a four month research project the data from the orbiters was used for assessing potential landing sites and a rover traverse planning. Mainly data from the Prospector and LRO were used to select regions of interest. The prior selection was based on slope, temperature and a geological map from the USGS.

Three sites on both the North as South Pole were used to test a proposed method for rover traverse planning. Besides the scientific interest, the sites where assessed on its accessibility for landing and roving. This assessment was done based on some assumptions what would be possible for landing and roving. For landing sites it was proposed to pick a site larger than 1km in diameter, in a (partial) illuminated area with a slope lower than 5^o, which was inside an area which would be accessible for a rover. The requirements to be selected as accessible area was a slope lower than 20^o, the largest polygon which meets this requirement was chosen as accessible area. As destination a site in the PSR was selected which was inside the accessible area and had extremely low temperatures. The boundary for extremely low was defined as 54K which is the sublimation temperature of CO_2 in lunar atmospheric pressure. As additional target for the rover a site was selected where the temperature difference would be more than 150K to study volatile migration processes.

A combination of tools in ArcGIS were used to do the site selection and rover traverse planning. In the end Rozhdestvensky and Amundsen were selected as most accessible and interesting. After comparing both regions, Amundsen was preferred because of the higher temperature variations and the flatter crater floor. The traverse was planned after a manual selection of landing site, site of interest and destination, which were together with a slope map the input for an automatically calculated traverse. Some additional work is proposed with respect to the site selection. More datasets can be used to complicate the traverse or select other regions than Rozhdestvensky or Amundsen.