

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 3 (3C)

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POSSIBILITIES FOR THE LANDING ON MARS SOUTHERN HIGHLANDS

Abstract

Since there is a huge scientific interest for the exploration of Martian higher elevations, especially in the southern hemisphere, as the oldest areas on Mars and large representatives of the Noachian eon of the planet's evolution, it is very important to analyze possibilities and techniques for the landing on these sites. The difficulty to achieve a safe landing on the high elevations on Mars becomes evident when having in mind that the highest elevation on which the successful landing was realized was about 1400 meters below the 6.1 mbar datum line, which was accomplished by Mars Exploration Rover Opportunity in Eagle crater in Maridiani Planum, positioned just 2 degrees southern from the equator. In this paper, by means of computational methods in fluid dynamics, are investigated possible entry, descent and landing (EDL) profiles into Martian atmosphere, including combination of ballistic, lifting and powered entry, in order to determine the optimal parameters for the safe landing on the high elevations. Optimal entry timing, regarding significant changes in Martian atmospheric profiles according to the Mars-GRAM 2010 atmospheric model, is also examined. The obtained results, according to expectations, indicate very strong influence of the planetocentric celestial longitude of the Sun and the solar activity on the optimal EDL profiles.