

# The Solar System – Exercise classes

## Problem Set 6

Distributed: 18 Nov 2024, Results due: 25 Nov 2024.

### Problem 6.1

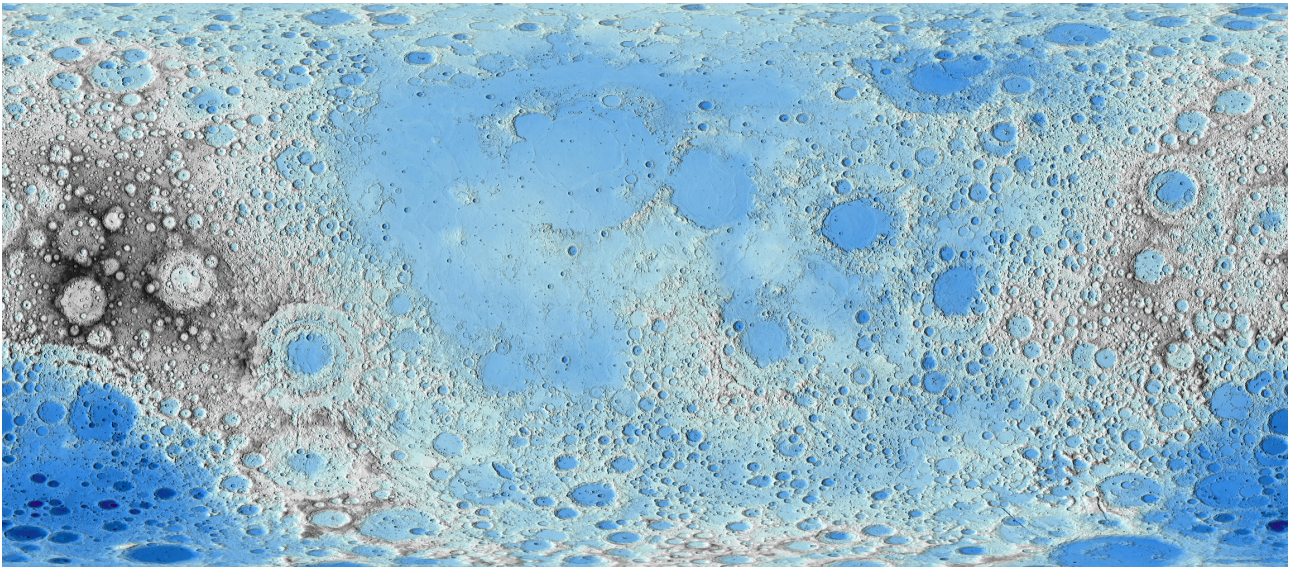
What is the minimum radius of an iron meteoroid ( $\rho \approx 8 \text{ g/cm}^3$ ) that is not significantly affected by the atmospheric drag of (a) Earth (surface pressure:  $p \approx 10^5 \text{ Pa}$ ) and (b) Venus ( $p \approx 9 \times 10^6 \text{ Pa}$ )? Estimate the resulting crater sizes. Assume two cases: (1) vertical impact and (2) impact at an angle of  $30^\circ$  with respect to the surface. (2 points)

### Problem 6.2

Estimate the minimum and maximum velocities at which a Solar-system object (that is not on an orbit bound to Earth) can impact on Earth. Neglect the atmospheric drag and Earth's rotation. (2 points)

### Problem 6.3

Assuming an impact velocity of 11 km/s, how much mass is required for an impactor to release enough energy to vaporize the oceans (heat of evaporation: 2.2 MJ/kg)? How much mass is required to free the water from Earth's gravitational bond? (2 points)



**Figure 1:** Topography of the crater-strewn Lunar surface. The blue depressions in the image center are the well-known maria on Moon's Earth-facing hemisphere. On its backside (also blue, lower left and right) sits the South-Pole-Aitken basin, the Moon's biggest impact structure, itself speckled with younger craters. (Lunar Reconnaissance Orbiter Camera)