

**Planetary Geology 4460 Homework #7 Solution Due Friday Oct. 27, 2017**

**1) Problem 1 (10 points)** The following figure shows the number of craters as a function of diameter, for different terrains on Mars.

a) List the relative ages of the various regions, from oldest to youngest. If for some regions you can't give relative ages, explain why.

*The units will be arranged from oldest to youngest as one moves down the diagram towards lower crater densities -- but you need to be careful to compare crater densities at the same crater diameter -- or extrapolate the measured densities along the correct slope line before comparing them. I'll explain the lines which cross in b), but in general large craters are less affected by incomplete resurfacing events so if we want the age of the underlying surface, not the resurfacing event, larger craters are better. Therefore the relative ages from oldest to youngest are: 1) uplands, 2a) Chryse landing site or, for large craters, 2b) south polar sediments, 3) Outer Tharsis volcanics, 4)a Olympus Mons volcano and 4b) Central Tharsis volcanics. We can't really distinguish 4a and 4b since there isn't a single crater size where measurements for both exist, yet they appear to lie upon extensions of the same line. A similar problem exists for 2a) and 2b), as detailed more below.*

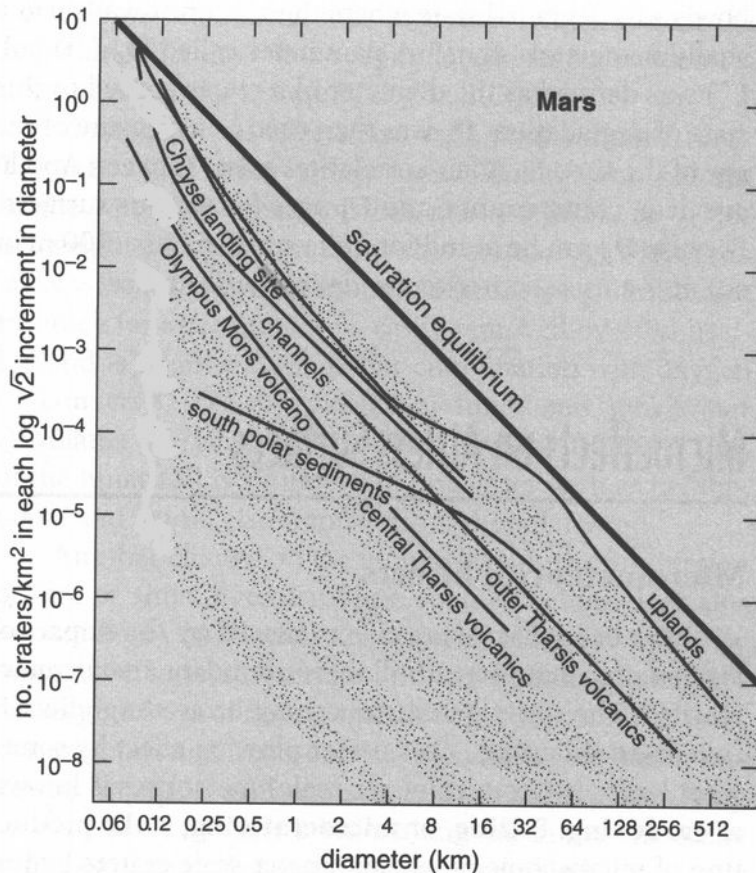


Figure 1. Crater count statistics for various regions on Mars

b) Give a reasonable explanation why the south polar sediments curve (and perhaps one other) start to rise less steeply (and almost turn horizontal) at small crater diameters.

*The age based on the large south polar sediment craters is probably the age of the underlying surface, but some process (probably aeolian transport of sediment) has erased some of the craters smaller than about 15 km. Similarly, some process, perhaps erosion or volcanism, has erased some of the upland craters smaller than about 50 km.*