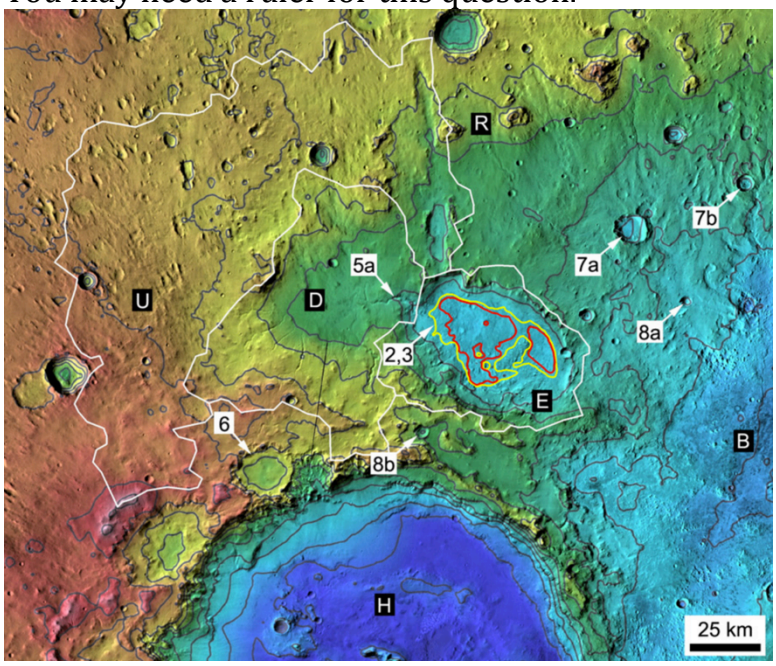
Earth and Planetary Surface Processes
Winter 2017
Problem set 5

Due in class Wed 1 Mar, 3pm.
Office hours **10am-11am**, Hinds 467 Monday 27 Feb (note change in time from 9am).

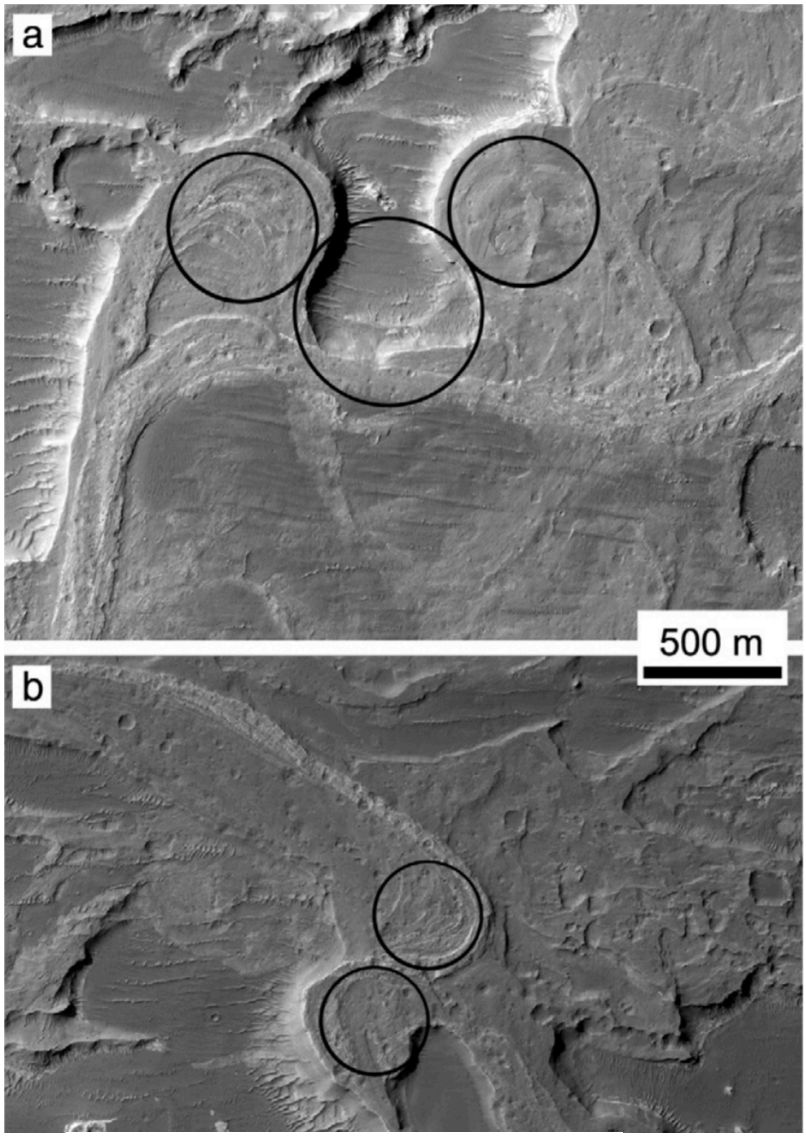
Q1. Consider a wide, shallow mountain belt whose bedrock fragments into 2cm-diameter clasts that cannot be further abraded. How will the height of this mountain belt differ from that of an otherwise identical mountain belt whose bedrock fragments into 1cm-diameter clasts that cannot be further abraded? Be quantitative (use the equations given in lecture).

Q2. Do Melosh problem 10.2 (pdf at http://geosci.uchicago.edu/~kite/doc/Melosh_ch_10.pdf). (Hint: it is OK to use equation 10.17).

Q3. Eberswalde paleohydrology (following Irwin et al., Geomorphology 2015)
You may need a ruler for this question.



On Mars ~3.5 Gyr ago water from the white-outlined catchment area drained into the lake outlined in yellow, forming a delta at the point marked "2,3". For this delta, we think only one trunk channel was active at any one time.



Use $Q_{1.5} = 0.011\lambda_m^{1.54}(0.62) = 0.0068\lambda_m^{1.54}$
to find bankfull discharge from the two meandering trunk streams shown above.
(Remember that wavelength = 2x half-wavelengths).
Assume a sediment:water ratio of 1:1000 (by volume) and a lake evaporation rate of 1 m/yr.

Assuming that the lake level stayed constant during construction of the delta:

What is the total evaporation / yr from the lake (in km^3)?
For how many days/year could the trunk streams have been flowing at bankful discharge?
What is the amount of sediment transported per year?
What is the lake lifetime implied for the measured delta volume of 6 km^3?

Q4. From Whipple & Tucker, JGR Planets, 1999 (in the suggested reading; pdf at):
Show that Equations 10a-10d in that paper follow from Equations 1-7 in that paper.