ESS 431 PRINCIPLES OF GLACIOLOGY
ESS 505 THE CRYOSPHERE

Lecture 10 – Alpine Glacier Systems: Response to climate, surge behavior, and tidewater glaciers
Due Monday, October 30 2017, at start of class

Raymond, C.F., 1987, How do glaciers surge? A review: Journal of Geophysical Research, v. 92, p. 9121

Roe, G.H., Baker, M.B., and Herla, F., 2016, Centennial glacier retreat as categorical evidence of regional climate change: Nature Geoscience, v. 1, doi: 10.1038/ngeo2863.

1) What is the primary mechanism that allows for glacier surges? What observations allowed Kamb et al. to rule out internal deformation as a mechanism for surge motion?
2) Sketch the typical surface profile of a glacier pre-surge and post surge.
3) What evidence indicates surging likely involves complex interactions between the ice and bed, as opposed to ice sliding over a clean, hard surface?
4) In their paper, Roe et al. are looking at whether or not observed glacial retreat could be a result of randomness in the system, or if it is statistically improbable without some global climate forcing. Don't get too bogged down in the math – simply explain the yellow curves and purple boxes in figure 4, and what intuition that provides about the statistical likelihood of observing modern glacier behavior without climate change.