**ESS 431 PRINCIPLES OF GLACIOLOGY**

**ESS 505 THE CRYOSPHERE**

**Lecture 09 – Ice Dynamics III: Temperature and Heat Flow in Glaciers and Ice Sheets**

*Due Wednesday, October 23 2019, at start of class*

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| Cuffey and Paterson:  *The Physics of Glaciers* Sections 9.5-9.8.  Dahl-Jensen et al. (1998). Past Temperatures Directly from the Greenland Ice Sheet. *Science*  282(5387), 268-271, doi: 10.1126/science.282.5387.268. |

1. What is the relative magnitude of advection and vertical diffusion in polythermal glaciers and ice sheets?
2. Give an argument for why it might be defensible to ignore horizontal heat diffusion in the heat flow equation?
3. How long does a change in temperature take to penetrate to the base of a glacier? To the base of an ice sheet?
4. What does the similarity between the Dye-3 and GRIP records indicate about the temperature changes they record? What do the differences in amplitude between the two records indicate?