

**ESS 431 PRINCIPLES OF GLACIOLOGY**  
**ESS 505 THE CRYOSPHERE**

**Lecture 16 – Permafrost:** Distribution, relationship to climate, physical processes and structure/engineering problems

*Due Monday, December 4 2017, at start of class*

Marshall, S., 2012. *The Cryosphere*. Chapter 7, p. 165–179.

Lachenbruch, A.H., 2001: Permafrost. *Oxford Encyclopedia of Global Change*

1. Approximately what percentage of land in the Northern Hemisphere is underlain by permafrost?
2. What is the term for the thawed ground adjacent to a river or lake in permafrost terrain?
3. Where is the active layer found? What makes this layer active? What is a characteristic thickness?
4. What is a clathrate hydrate? What is the most common hydrate found in permafrost?
5. How long does it take until a rapid 2-degree C surface warming would raise the temperature by 1 degree C at 100 m depth?