ESS 533 Class Summary 5/09
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We performed an overview of firn, firn depth-density profiles, the processes that act to densify firn, and the importance of firn densification in glaciological applications. The key takeaways are as follows.

The firn layer is generally divided into three zones because the densification physics tend to change as different marked densities are reached. Zone 1 occurs at low densities (from snow density to ~550 kg m^{-3}) and is governed by processes such as grain settling and grain-boundary sliding. In zone 2 (from densities of ~550 kg m^{-3} to 820 kg m^{-3}), the grains are close enough together so that other processes that act to increase the grain "necks" (i.e., sintering processes) govern densification. Zone 3 is designated as the zone below bubble close-off (~820 kg m^{-3}, or ~11% air) to ~ice density, where bubble compression is the main process of densification. Below this zone (in the glacier ice), minimal density changes occur, mainly through clathrate formation. Note, however, that multiple densification processes occur at all densities, and that I have listed the ones that tend to dominate densification at the specific density ranges.

Another key point that we discussed is why we care about firn densification. Firn densification is important mainly for two glaciological applications. Firstly, changes in firn-densification rate are important to account for in ice-sheet mass balance calculations that are derived from repeat satellite-altimetry measurements. Secondly, accurate consideration of firn-densification is necessary to determine the air/ice age relation for interpretation of ice cores.