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Dynamic recrystallization in polar firn and ice

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The classical view of the microstructure evolution in polar is: normal grain growth, i.e. grain growth driven by grain boundary surface energy, predominates in the upper part of an ice sheet; in the middle part grain division by polygonization, which explains the stop of grain growth in some ice cores (e.g. Byrd or GRIP); in the bottom part, which is characterized by high temperature and shearing, grain boundary migration recrystallization (GBMR) leads to the large grain sizes observed close to bedrock. New results discussed here question this scheme as too simplistic.

High resolution imaging methods (e.g. microstructure mapping) reveal microstructural features characteristic of dynamic recrystallization in firn, shallow and deep ice: e.g. different types of subgrain boundaries, irregularly shaped and bulging grain boundaries, formation of new grains, and slip bands. In contrast to previous results which report a linear increase in grain size in firn and the upper hundreds of meters of ice sheets, we find no significant growth in firn and across the firn-ice transition. Our results suggest that dynamic recrystallization is active in firn and ice at any depth and that in the EPICA Dronning Maud Land (EDML) core dynamic recrystallization is the predominant recrystallization regime from the firn-ice transition to bedrock.