



Structures and fabrics in a valley glacier: Storglaciären, Sweden

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Deformation in glacial ice involves both brittle and ductile components at a high homologous temperature, and this is reflected in the structures and fabrics that develop. Storglaciären, a small polythermal glacier in northern Sweden provides a good illustration of this. Dynamic recrystallization associated with the dominance of intracrystalline glide on the basal plane results in well developed crystallographic preferred orientation fabrics (CPOs) with a concentration of *c*-axes at a high angle to the plane of maximum shear strain in marginal and basal ice. In these marginal and basal zones, there is near parallelism between the plane of maximum finite strain and maximum shear strain rate. Unlike in 'cold' ($T < -10^{\circ}\text{C}$) ice, in which a single *c*-axis maximum is typical, in 'warm' ($T > -10^{\circ}\text{C}$) ice a multimaxima pattern develops, with a diamond appearance in stereographic projection. Primary stratification, foliation and fracture traces are marked by variation in bubble distribution and concentration. Primary stratification survives to quite large strains but becomes indistinguishable from foliation at high strains, with both becoming nearly parallel to the plane of maximum shear strain in marginal and basal ice. Fracture traces, marked typically as veins by bands with no bubbles or with bubbles marking a central suture, provide good strain markers as they rotate. Little or no shape-preferred orientation (SPO) and large grain size in the highly deformed and recrystallized ice are an indication of the effectiveness of grain boundary mobility. Bubbles influence the recrystallization and are reorganized on the grain scale during recrystallization to create an element of the foliation, to which stratification and fracture traces also contribute in the most highly deformed ice. The development of extensional fractures in foliated marginal ice creates perturbations in the subsequent flow and rotation of the fracture trace that results in flanking folds.