ABSTRACT. A high-resolution study of c-axis fabrics has been performed on the NGRIP deep ice core from North Greenland. A newly developed automatic ice fabric analyzer has been used to measure c-axis orientations on vertical thin sections at 142 different depths between 100 m and 2930 m in the core. Detailed comparison studies show that this new method produces results which are in full accordance with those obtained from conventional manual measurements.

Fabric development in ice can be explained by rotation of c-axes, controlled by the prevailing stress systems. In the upper 800 m the c-axes appear to distribute uniformly but in the depth interval 900-2500 m the c-axes tend to cluster around a vertical plane. This vertical girdle pattern is strengthened with depth, forming the first clear evidence of this fabric type in a Greenland deep ice core. Such fabric development has previously been observed in the Vostok ice core from East-Antarctica, where converging flow is believed to occur. The most likely interpretation of the NGRIP girdle fabric is that the c-axes are rotating away from a horizontal axis of tension across the main ice divide, which runs NNW-SSE through the NGRIP drilling site. This is supported by information available from surface velocity measurements.

Within the girdle fabric, increased concentration of c-axes parallel to the core axis is observed with increasing depth, indicating combined effects of vertical compression and horizontal tension on the fabric development. From a depth of 2587 m, the girdle type fabric starts to give way to a strong vertical single-maximum fabric, which persists to a depth of 2930 m, where drilling was terminated 150 m above bedrock in the year 2000. The single maximum seems to suggest that bed-parallel simple shear is exerting a strong influence on the fabric in the lowest part of the ice sheet.