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DYNAMIC RECRYSTALLIZATION ASSOCIATED WITH GAS COMPOSITION CHANGES IN BASAL ICE FROM AN ANTARCTIC GLACIER

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It becomes now more and more recognized that ice present at the base of glaciers and ice sheets plays a key role not only in the incorporation of sediments, but also in the dynamics of the whole ice body itself. In this perspective, subglacial tunnels provide unique opportunities to investigate how ice reacts to glaciotectonic processes and how sedimentological features are formed. Here we report crystallographic as well as gas compositional results obtained in basal ice excavated from a 20m-long tunnel dug at the margin of Taylor Glacier - an outlet glacier from the East Antarctic Ice Sheet. By the use of an automated c-axis analyser, the crystallography of debris-laden ice was investigated in order to gain insight into the deformation processes occurring at the base of the glacier. Clear changes in the ice crystal fabrics - which resemble those described at the bottom of some deep ice cores - have been observed at the interface between debris-free and debris-rich ice layers of the basal ice sequence. The ice crystal orientations evolve from a single-pole fabric normal to the foliation in the clean ice, to a multiple-pole fabric at the interface with debris-rich ice bands. These fabric changes are systematically associated with sharp changes in gas composition that are typical of selective gas dissolution. Surprisingly, the total gas volume of the ice has not been subject to any significant alteration. These results clearly point to the occurrence of localized dynamic recrystallization together with an increase in intercrystalline/interfacial

liquid water content at the contact between rheologically contrasted types of ice. One important implication of these phenomena is that intense deformation occurring at the base of glaciers and ice sheets may lead not only to a structural reorganization of the ice, but also - in specific conditions - to an alteration of its compositional signals.