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In Situ X-Ray-micro-tomography of Snow at the EPICA-Drill site Dronning Maud Land (DML), Antarctica

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The firnificaton of dry polar firn has been investigated with the means of X-ray micro-computer tomography (CT). The measurements were carried out on shallow firn cores and snow pit samples during the field campaign 2005/2006 at the EPICA (European Project of Ice Coring in Antarctica) DML-drill site, Antarctica. The CT-devices have been successfully tested in the field and offered us a novel method to study the fragile three dimensional structures of deposited snow and firn.

Several events of dune formation have been observed during the summer campaign. The dunes are well preserved in the deeper snow with the consequence of highly stratified firn. In this presentation we give a detailed description of stratigraphy with the focus on the evolution of pore/ice cluster sizes and intergranular bonding. We show that the number of bonds per cluster in samples near the surface is highly correlated to their respective density. Accordingly, the neck radii are anticorrelated to the density. Maxima of pore size and anisotropy are observed at 2 to 3 meter depth where the metamorphism is dominated by temperature gradients. To highlight the methodological aspect we present different size parametrisations and discuss the three dimensional CT- approach in relation to the standard two dimensional techniques.