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Continuous Measurements of Air Content: First Results from the EDML Ice Core, Antarctica and comparison to EDC

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The air content in cold glacier ice depends on the pore space volume and on local air pressure and temperature at the time of pore close-off. A new method to measure the air content of glacier ice has been developed and will be presented. The measurement has been integrated into the Continuous Flow Analysis set-up which is used for chemical profiling of the EPICA ice cores. It allows the continuous determination of the air content at high depth resolution (<1cm). The air content has been measured continuously in the deep ice core from Dronning Maud Land (EDML), Antarctica from 700 m to 2564 m depth, which tentatively corresponds to approx. 10 ka to 230 ka before present. We find a mean air content of 0.0815 ml_{STP}/g, which corresponds to a mean firn density of 0.838 g/cm^3 at pore close-off. The profile exhibits long term variations of about 10%; these are not dominated by the 100ka cycle but instead by the 42 ka insolation cycle. The aircontent profile from EDML is compared to the one from EPICA Dome-C with respect to mean value, degree and phasing of the variations. The high resolution record available from EDML exhibits strong variability of the air content even on the 1 cm scale. The air content does not follow a clear seasonality in the examples investigated. The high resolution examples with larger relative variability also show higher average air content. This suggests that the average air content may be increased by stronger small-scale density variations, as the effective pore close-off may happen at shallower depths in these cases due to formation of „lids“ in layers with high density, which can trap the air below in areas with relatively high porosity. These

density variations in turn may be connected to local surface insolation.