



Layered trapping of gases in East Antarctic ice: insights from the firn column structure

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Polar firn is a layered material with heterogeneities in terms of density and structural properties. Recently, the heterogeneous stratification of firn has been linked with the presence of anomalous values in ice core gas records. Thanks to the study of a new firn and ice core from the East Antarctic plateau (Lock-In, 136km away from Concordia station towards Dumont d'Urville station), we aim to document the link between pore closure in the firn column and the gas records. For this purpose, the firn core was analyzed for various properties, including density, closed porosity ratio, pore morphology, methane, air content, and chemical content. A special emphasis was put on the characterization of stratification and heterogeneities in the trapping zone of the firn. Our findings suggest that in this part of the firn, all layers, including abnormally dense or less dense layers, mostly obey a common law relating density to pore characteristics such as closed porosity ratio or pore morphology. This means that abnormally dense layers close at the same density as the rest of the firn, but at shallower depths and thus earlier. This picture is corroborated with the study of an early closure layer found in the bubbly ice core. Previous studies highlight the link between chemistry and the development of stratification of the firn column. Investigation of our chemistry data suggests that this link persists down to the firn-ice transition, with ion-rich layers being the denser in the trapping zone and closing-off earlier.