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Simple relations for the close-off depth and age in dry-snow densification

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Abstract

A physical model for the snow/firn densification process (Salamatin and others, 2006) and Martinerie and others' (1992, 1994) correlation for the firn density at the pore closure are employed to perform a scale analysis and computational experiments in order to deduce simplified relations for the close-off depth and ice age in quasi-stationary ice formation conditions. The critical snow density at which ice-grain rearrangement stops is used to take into account variability of snow structures subjected to densification. The results obtained are validated on a representative set of ice-core data from 22 sites which covers wide ranges of present-day temperatures and ice accumulation rates. A simple analytical approximation for the density-depth profile is proposed.

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