

AGE-DEPTH CORRELATION, GRAIN GROWTH AND DISLOCATION ENERGY EVOLUTION, FOR THREE ICE CORES

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Two previous theoretical analyses of data from the GRIP, Vostock and Byrd ice cores, presenting age-depth correlations, grain growth and dislocation energy evolution, are re-examined. It is found that the age-depth correlations are inconsistent with the idealised flow with unchanging history adopted, but that good correlations can be obtained by relaxing those restrictions. A modified grain growth relation is proposed consistent with the distinct growth profiles of the Vostock and the other two cores, which can be solved simultaneously with the given dislocation density evolution equation. These are solved for all three cores with the given parameters, and the depth profiles of grain diameter and dislocation density at the present time determined with the new age-depth correlation and with that shown empirically in the papers. The varying flow history influences the age-depth correlation, and hence the depth profiles, which is important both for the interpretation of core data, and for the determination of constitutive variables at each depth at the present time.