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# Interpolating an ice core depth-age relationship from sparse data using an inverse approach

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Often Antarctic ice cores can be dated at only a sparse number of discrete depths; however, it is desirable to have a physically based interpolation of the depth-age relationship between the sparse dated points. Interpolation schemes that do not properly account for the variation of dynamical strain with depth due to ice flow (for example piece-wise linear and spline interpolations) can introduce serious error, because these interpolations over-fit the data and are not physically based. We use an inverse method to determine an accumulation-rate history that reproduces the measured depth-age data to a tolerance specified by data uncertainty. The forward problem is a transient one-dimensional kinematic ice-flow model that produces a depth-age relationship, based on histories of ice thickness, divide migration and accumulation rate. The accumulation-rate history inferred in the inverse problem produces a more realistic interpolation of the measured depth-age data. The accumulation-rate history may be determined if the ice dynamics histories are known. Regardless of whether the unique accumulation history and ice dynamics pair can be determined, our depth-age interpolation is robust.