



Inferring paleo-accumulation records from ice-core data by an adjoint method

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Ice cores contain a record of Earth's climate, and are used to understand how recently observed changes in climate fit within a long history of natural climatic variability. For a complete climatic record, a dated history of snow-accumulation needs to be derived as this gives information about past atmospheric circulation and a history of mass imbalance for the polar regions. We present here a novel adjoint method to construct a complete climatic record by both optimally dating an ice-core and deriving from it a detailed accumulation history. Our modelling approach uses all the available data extracted from the ice-core of the distribution with depth of age and thickness of an annual layer and present temperature. We discuss the applicability of our method to different ice-core characteristics and time-scales, and compare our method results with more commonly employed Bayesian techniques. We conclude that our methodology is more efficient and deals better with noise in the observed variables.