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Analysis of Time series with Unknown Times Using a Hierarchical Chronology Model

Time series analysis is well developed when sampling times are known, but latent times pose an additional challenge. For example, paleoenvironmental core data consist of samples collected at sequential depths in an extracted core (e.g. sediment, ice). The age of samples is unknown partly due to variation in deposition rate of the core material. A chronology model that relates depth to age is required in order for time series analysis to proceed. Early approaches included curve fitting and piecewise linear chronology models. More recent approaches model the deposition process but allow unrealistic deposition rates. I present a Bayesian hierarchical approach that regularises deposition rates at the prior level. The model is then incorporated into the overall time series analysis framework.