Automatic adjustment of astrochronologic correlations

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Here we present an algorithm for the automated adjustment and optimisation of correlations between proxy data and an orbital tuning target (or similar datasets as e.g. ice models) for the R environment (R Development Core Team 2008), building on the 'astrochron' package (Meyers et al.2014). The basis of this approach is an initial tuning on orbital (precession, obliquity, eccentricity) scale. We use filters of orbital frequency ranges related to e.g. precession, obliquity or eccentricity of data and compare these filters to an ensemble of target data, which may consist of e.g. different combinations of obliquity and precession, different phases of precession and obliquity, a mix of orbital and other data (e.g. ice models), or different orbital solutions.

This approach allows for the identification of an ideal mix of precession and obliquity to be used as tuning target. In addition, the uncertainty related to different tuning tie points (and also precession- and obliquity contributions of the tuning target) can easily be assessed. Our message is to suggest an initial tuning and then obtain a reproducible tuned time scale, avoiding arbitrary chosen tie points and replacing these by automatically chosen ones, representing filter maxima (or minima). We present and discuss the above outlined approach and apply it to artificial and geological data. Artificial data are assessed to find optimal filter settings; real datasets are used to demonstrate the possibilities of such an approach.

References:
Meyers, S.R. (2014). Astrochron: An R Package for Astrochronology.
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R Development Core Team (2008). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org.