Quantitative comparison of trends in palaeo-environmental time series

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Analysis and comparison of trends in temporal datasets is a common occurrence in many scientific disciplines. However, in palaeo-environmental and geological sciences, unlike many other disciplines, the datasets frequently consist of unpaired observations, which are often irregularly distributed along the primary axis (time). Currently, there is no accepted quantitative technique for the analysis of co-trending in the temporal behaviour of such datasets. Hence, comparison of palaeo-environmental data is usually obtained by qualitative visual interpretation (i.e. comparing peaks in curves), which may be both subjective and ambiguous. Here a new quantitative technique for comparing temporal trends and behaviour in irregular distributed datasets is introduced and illustrated. Two simple and intuitive indices are proposed, which respectively calculate the degree of (dis)similarity in short-term and long-term patterns in the datasets. The calculation procedure not only quantifies (dis)similarity in the curves, but also establishes the significance thereof. This paper presents the derivation, application, potential and limitations of the proposed indices.