Milankovitch Pattern Recognition in Multi-Way Climatic Data Sets: a new Method.

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Principal tensor analysis (PTA) is considered as a potentially useful tool in geosciences, particularly for reconstruction of paleo-climate based on multi-way (time – space – proxies) datasets. Possible restrictions and main reasons of the method limitation are discussed. We introduce an advanced method of PTA: PTA enhanced with Singular Spectrum Analysis (SSA). The method has been applied to 4-way data tensor (time – space – proxies – delay-time) constructed from marine sediment proxies.

Main conclusions

Pessimistic. PTA will not be really in demand in geology in the coming years because:

1. Geological data are always space distributed. It is not an easy task to construct correct and accurate time scales to build a reliable n-way data tensor for multi-way data analysis.

2. Standard statistical packages popular in geology such as Statistica and SPSS Statistics do not offer needed functionality.

3. Few papers with clear explanations for non-mathematician are available in the literature.

Optimistic. Several alternative solutions to run PTA are available now in the Internet for free:

1. R:

    (a) PTAk,

    (b) rTensor,

    (c) TensorBF

    (d) . . .

2. Python:

    (a) scikit-tensor,

    (b) pytensor,

    (c) tensorly

    (d) . . .

Enhanced method has demonstrated more interpretable and clear results. The algorithm has been implemented as an R function.