EMS Annual Meeting Abstracts
Vol. 12, EMS2015-343, 2015
15th EMS / 12th ECAM

Randomized MSSA in finding the significant oscillations in the 20th century reanalysis data

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This study demonstrates a method to extract signals that propagate in time and space from a high-dimensional global data set. We are analysing several atmospheric variables of 20th Century Reanalysis V2 data provided by the NOAA/OAR/ESRL PSD. Our analysis tool is multichannel singular spectrum analysis (MSSA) which has been used in various climate data studies. In this study we apply a randomized singular value decomposition method to speed up the MSSA calculation.

The resulting signals are tested against a red noise null-hypothesis through Monte-Carlo simulation. Significant signals are identified on annual, inter-annual and decadal scales resembling some of the well-know oscillatory patterns, such as El Nino – Southern Oscillation (ENSO), North Atlantic Oscillation (NAO) and Antarctic oscillation (AAO). The propagation of the global pattens related to the signals are also visualized. Further analysis aims at estimating the relative importance of the identified climate signals in different parts of the world and their interaction.