

## Optimal Filtering in Singular Spectrum Analysis

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### Abstract

Singular spectrum analysis (SSA) provides a robust method of separating an arbitrary signal from "white" (independent identically distributed) noise. In the presence of "coloured" noise, or any autocorrelated process, high-variance components of the noise can confuse the singular value decomposition, thereby obscuring genuine signals which are, in principle, detectable. A generalisation of SSA is presented which yields an optimal filter to discriminate against an arbitrary coloured noise and an objective method of quantifying uncertainty in signal reconstruction. The algorithm is applied to a simple synthetic signal-separation problem and used to resolve a degeneracy in the SSA of interannual and interdecadal variability of the Earth's global mean temperature.

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