

Description of R codes for Most Predictable Component of a Linear Stochastic Model

This Github site contains the codes for generating figures in the paper “The Most Predictable Component of a Linear Stochastic Model” by DelSole and Tippett (2023). Below is a brief description of each file.

NDim.master.R Generates figure 1: APT versus eigenvalue spacing Δ of the APT-optimal for dimensions $D = 2, 3, 4, 5$, as well as the associated optimal projection vectors at small Δ .

NDim.timeseries.R Generates figure 2: time series of eigenmodes and the APT-optimal, as well as the predictability P_τ and autocorrelation functions.

NDim.GenPascal.R Generates figure 3: maximum APT as a function of Δ and exponent p .

rank1.ERSST.R Generates figure 4, 5, 6: maximum APT for various stochastic models as a function of EOF truncation D , and the associated P_τ 's. The three figures are obtained by choosing `area.name = NASST, NPSST, PACIFIC30S30N`. Users should change `dir.ersst` to the directory containing ERSSTv5 data.

Auxiliary Codes

gev.R function solves generalized eigenvalue problem $\mathbf{A}\mathbf{q} = \lambda\mathbf{B}\mathbf{q}$ with real matrices \mathbf{A} and \mathbf{B} .

gev.complex.R function solves generalized eigenvalue problem $\mathbf{A}\mathbf{q} = \lambda\mathbf{B}\mathbf{q}$ with complex matrices \mathbf{A} and \mathbf{B} .

pdf.eps.R function for printing figures in PDF format

lyap.R function for solving the Lyapunov equation

index.climate.v2.R function for identifying a domain in gridded data sets. Points inside the domain are set to TRUE, points outside the domain to FALSE.

plot.eof.R function for plotting the spatial structure and time series of an EOF.

eof.latlon.R function for computing EOFs given gridded data.

plot.latlon.contour function for generating shaded plots with contours

plot.latlon.v4 function for generating shaded plots

References

DelSole, T. and M. K. Tippett, 2023: The most predictable component of a linear stochastic model. *Proceedings of the Royal Society of London. Series A - Mathematical and Physical Sciences*, **submitted**.