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 **?**. 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-optimals, 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, PACICIF30S30N. Users should change `dir.ersst` to the directory containing ERSSTv5 data.

Auxiliary Codes

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

gev.complex.R function solves generalized eigenvalue problem $\mathbf{Aq} = \lambda\mathbf{Bq}$ 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**.