

Course topics

Eigenvector and principal component analysis

Methodological approaches and examples

Practical interpretation of results

Binomial, Gaussian, and Poisson frequency distributions in meteorology/climatology

The 4 statistical moments: mean, variance, Skewness, kurtosis

Methods for displaying and performing initial evaluations of climate data

The Chi-Square, t-, z-, and F- distributions

goodness of fit, testing the Gaussian distribution;

tests of variance and significance

Preparing time series datasets for analysis

detection of discontinuities, inhomogeneities and trend.

Linear Regression and Correlation analysis

interpretation and statistical significance of trend and correlation

the problem of autocorrelation

non-parametric correlation tests

Evaluation of Time Series

Trend analysis and trend reversal detection

Regime shift and climatic fluctuation detection

Spectral and Cospectral Analysis

Practical application of simple spectral analysis

Interpreting statistical significance

The cospectrum and its link to correlation

Time series filtering

How to create simple binomial low pass, high pass and band pass filters

Specifying filter characteristics and testing strength of signal

Paper Descriptive Summaries: Students will be responsible for submitting 6 descriptive summaries of scientific research papers (plus others to be assigned) that (i) focus on the area of climate, meteorology, or hydrology and (ii) contain statistical analyses of time series, and (iii) which were not formally discussed in class. Two or three of these descriptive summaries will be due by Thursday October 29 and the remaining summaries due on Thursday December 3 (last day of seminar). For each of the 6 articles, the descriptive summary will be about two pages types, each containing the following sections (in order):

(1) "Reference": the complete literature reference to the article.

(2) "Background": description of what was done in the past on the paper's research subject material.

(3) "What was Done": description of the methodology, including statistical methods, in the analysis performed in the study of climate or other type of data.

(4) "What was Learned": What did the analysis determine, overview of key findings.

(5) "What it Means": Description of the broader implications of the study, new ideas that it promotes, new avenues of thinking about a climate problem.

References to other papers within your summary need not be placed in a bibliography; such references should appear as follows in a line of your summary text, e.g., "...based on previously identified North Atlantic storm tracks (Rogers *et al.*, 1997; *J. Climate*)."

Descriptive Summary of professional Research Papers

Length: about two pages typed, each containing the following sections (in order):

(1) “Reference”:

The complete literature reference to the article. Example follows...

Sun, B., and P.Y. Groisman, 2004: Variations in low cloud cover over the United States during the second half of the Twentieth Century. *Journal of Climate*, 17, 1883-1888.

(2) “Background”:

Paragraph description of what was done in the past on the paper’s research subject material.

(3) “What was Done”:

One or more paragraph description of the methodology, including statistical methods, in the analysis performed in the study of weather, climate, or other type of data.

(4) “What was Learned”:

Multiple paragraph description of what the analysis determined; an overview of the paper’s key findings.

(5) “What it Means”:

Paragraph or so description of the broader implications of the study, new ideas that it promotes, new avenues of thinking about a climate problem.

References to other papers within your summary need not be placed in a bibliography; such references should appear as follows in a line of your text in part 2 through 5 above, e.g., “...based on previously identified North Atlantic storm tracks (Rogers *et al.*, 1997; *J. Climate*).”