Climatology papers
An Annotated Bibliography

Elisa Jager (erj983@uowmail.edu.au)
University of Wollongong

June 26, 2016

References

[1] R. E. Benestad, "A simple test for changes in statistical distributions," *Eos, Transactions American Geophysical Union*, vol. 89, no. 41, pp. 389–390, 2008. [Online]. Available: http://dx.doi.org/10.1029/2008EO410002

The simple i.i.d. test It can be very complicated to determine whether a time series is exhibiting some kind of systematic change through normal methods of TS analysis. A simple test is given here that can indiciate whether a series is made up of i.i.d. numbers. It is based on considering the probability of a new entry in the series being the most extreme entry, giving a simple predicting rule of E(n) = sum from i=1..,n of (1/i). If n is very large then exp(E(n)) is approximately linearly proportional to n. There is an apparent lack of such methods in the literature and it has a strength in that it assumes nothing about the pdf of the series, only that there is only one max value and that there is no upper limit on the values. Series ca be split into parallel streams of the data it can be more effective also. Examples of useage include looking at monthly temperatures for record values and studying future trends in extreme monthly rainfall. A 'failed test' does not imply there is a trend but can help identify a lack of i.i.d. data and thus a changing pdf. Some data needs to be sammpled correctly to be expected to be i.i.d. (eg. may contain seasonality effects).

[2] W. Cai, P. van Rensch, and T. Cowan, "Influence of global-scale variability on the subtropical ridge over southeast australia," *Journal of Climate*, vol. 24, no. 23, pp. 6035–6053, 2011. [Online]. Available: http://dx.doi.org/10.1175/2011JCLI4149.1

[3] P. k. Consortium, "Continental-scale temperature variability during the past two millennia," *Nature Geosci*, vol. 6, no. 5, pp. 339–346, May 2013.

[4] D. H. Douglass, "Topology of earth's climate indices and phase-locked states," *Physics Letters A*, vol. 374, no. 40, pp. 4164 – 4168, 2010. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S0375960110010030

[5] ——, "Phase-locked states and abrupt shifts in pacific climate indices," *Physics Letters A*, vol. 377, no. 2830, pp. 1749 – 1755, 2013. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S0375960113004428

[6] J. Emile-Geay, K. M. Cobb, M. Carre, P. Braconnot, J. Leloup, Y. Zhou, S. P. Harrison, T. Correge, H. V. McGregor, M. Collins, R. Driscoll, M. Elliot, B. Schneider, and A. Tudhope, "Links between tropical pacific seasonal, interannual and orbital variability during the holocene," *Nature Geosci*, vol. 9, no. 2, pp. 168–173, Feb 2016.

[7] T. R. Karl, R. W. Knight, K. P. Gallo, T. C. Peterson, P. D. Jones, G. Kukla, N. Plummer, V. Razuvayev, J. Lindseay, and R. J. Charlson, "A new perspective on recent global warming: Asymmetric trends of daily maximum and minimum temperature," *Bulletin of the American Meteorological Society*, vol. 74, no. 6, pp. 1007–1023, 1993. [Online]. Available: http://dx.doi.org/10.1175/1520-0477(1993)074¡1007:ANPORG¿2.0.CO;2

> This was a large combined study looking at many global locations and analysing the change in daily maximum and minimum temperatures as well as the diurnal temperature range (DTR). Monthly mean maximum and minimum temperatures for over 50% (10%) of the Northern (Southern) Hemisphere landmass, accounting for 37% of the global landmass, indicate that the rise of the minimum temperature has occurred at a rate three times that of the maximum temperature during the period 195190 (0.84C versus 0.28C). The decrease of the diurnal temperature range is approximately equal to the increase of mean temperature. The asymmetry is detectable in all seasons and in most of the regions studied. The Northern Hemisphere reported decrease in DTR of 1.4 degrees/100 years compared to an increase in the mean temperature of 1.3 degrees/100 years. There are also reported locations where the minimum temperature has not changed but noticeable change in variability and some possible indication of anticorrelation between increasing mean temperature and decreasing DTR. Decrease in DTR may be aprtially related to increases in cloud cover in the same locations. A large number of atmospheric and surface boundary conditions are also shown to affect max and min temperatures.Paper is limited by access to a lot of global data and is slightly dated now. [note: look for more recent and more Australia focussed paper on diurnal ranges]

[8] A. D. King, N. P. Klingaman, L. V. Alexander, M. G. Donat, N. C. Jourdain, and P. Maher, "Extreme rainfall variability in australia: Patterns, drivers, and predictability," *Journal of Climate*, vol. 27, no. 15, pp. 6035–6050, 2014. [Online]. Available: http://dx.doi.org/10.1175/JCLI-D-13-00715.1

[9] S. C. Lewis and A. D. King, "Dramatically increased rate of observed hot record breaking in recent australian temperatures," *Geophysical Research Letters*, vol. 42, no. 18, pp. 7776–7784, 2015, 2015GL065793. [Online]. Available: http://dx.doi.org/10.1002/2015GL065793

[10] P. Maher and S. C. Sherwood, "Disentangling the multiple sources of large-scale variability in australian wintertime precipitation," *Journal of Climate*, vol. 27, no. 17, pp. 6377–6392, 2014. [Online]. Available: http://dx.doi.org/10.1175/JCLI-D-13-00659.1

> [still editing] Precipitation is influenced by multiple large-scale natural processes. Many of these large-scale precipitation drivers are not independent of one another, which complicates attribution. Moreover, it is unclear whether natural interannual drivers alone can explain the observed longer-term precipitation trends or account for projected precipitation changes with global warming seen in climate models. Separating the main interannual drivers from processes that may prevail on longer time scales, such as a poleward circulation shift or increased specific humidity, is essential for an improved understanding of precipitation variability and for making longer-term predictions.In this study, an objective approach to disentangle multiple sources of large-scale variability is applied to Australian precipitation. This approach uses a multivariate linear independence model, involving multiple linear regressions to produce a partial correlation matrix, which directly links variables using significance thresholds to avoid overfitting. This is applied to regional winter precipitation in Australia as a test case, using the ECMWF Interim Re-Analysis (ERA-Interim) and Australian Water Availability Project

datasets. Traditional drivers and several drivers associated with the width of the tropics are assessed. The results show that the web of interactions implied by correlations can be simplified using this multivariate linear independence model approach: the total number of apparent precipitation drivers was reduced in each region studied, compared to correlations meeting the same statistical significance. Results show that the edge of the tropics directly influences regional precipitation in Australia and also has an indirect influence, through the interaction of the subtropical ridge and atmospheric blocking. These results provide observational evidence that changes associated with an expansion of the tropics reduce precipitation in subtropical Australia. The influence of many drivers and factor on MDB precipitation is given througout the paper and agreements and contradictions with other publications discussed. Comparison is made to the differing results of (Cai et al 2011) multiple times.

[11] N. D. Mueller, E. E. Butler, K. A. McKinnon, A. Rhines, M. Tingley, N. M. Holbrook, and P. Huybers, "Cooling of us midwest summer temperature extremes from cropland intensification," *Nature Clim. Change*, vol. 6, no. 3, pp. 317–322, Mar 2016.

[12] W. Newman, B. Malamud, and D. Turcotte, "Statistical properties of record-breaking temperatures," *Phys Rev E.*

[13] N. Nicholls, W. Drosdowsky, and B. Lavery, "Australian rainfall variability and change," *Weather*, vol. 52, no. 3, pp. 66–72, 3 1997. [Online]. Available: http://dx.doi.org/10.1002/j.1477-8696.1997.tb06274.x

Australia has more variable rainfall than would be expected from comparisons with similar climates globally. The El Nino Southern Oscillation (ENSO) has a large role in this and is itself not a constant influence. Changes in annual rainfall have been closely correlated to variations in the diurnal temperature range, annually and on the longer decadal scale, but this has broken down in the 1990s (dataset ends in 90s as well). This may signal a regional climate shift. Correlations can also be found between rainfall and max and min temperatures respectively but of opposite sign. There is also evidence of these relationships changing seasonally in QLD. Mean rainfall nationally rose from 1952-92 compared to 1911-51 and the variability also increased, but not significantly. Relative Variability of annual rainfall has been defined as the mean of the absolute deviations of annual rainfalls from the long term mean, given as a percentage of the long term mean. Rainfall variability decreases globally in locations with higher mean annual rainfall, but much of Australia does not fit the trend well. The MDB can be seen in figures to have higher than global average rainfall variability relative to its mean rainfall, falling in the range of 1-1.75 times the global average. On a national scale the annual rainfall is very variable and over the period of 1910-92 the histogram of the data cannot be fitted by a gamma distribution, as is commonly done, but instead require a Gumbel (or extreme) distribution. The Southern Oscillation Index (SOI) is the standardised difference between Tahiti and Darwin surface atmospheric pressure. A large SOI often leads to high rainfall (La Nina). The higher variability of Australia on a global scale is important to consider for research and practical activities.

[14] S. E. Perkins, D. Argeso, and C. J. White, "Relationships between climate variability, soil moisture, and australian heatwaves," *Journal of Geophysical Research: Atmospheres*, vol. 120, no. 16, pp. 8144–8164, 2015, 2015JD023592. [Online]. Available: http://dx.doi.org/10.1002/2015JD023592