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Verifying the Accuracy of Seasonal Climate Outlooks

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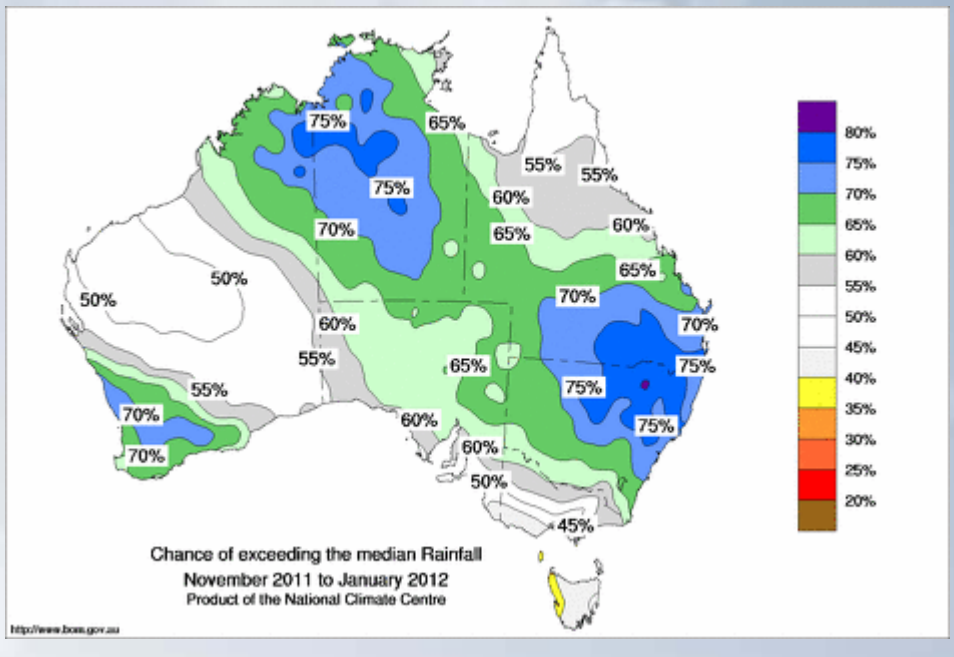

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Background

Seasonal rainfall outlooks have been issued by the Bureau of Meteorology since the late 1980s, whilst seasonal minimum and maximum temperature outlooks have been issued from early 2000.

The purpose of this paper is to present preliminary results from an analysis of how accurate these outlooks have been.

For almost the entire period, the outlooks have been represented by a map of Australia with the probability of the parameter predicted (total rainfall, mean minimum and mean maximum temperature) exceeding the median.

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Methodology

For each state and season, the forecast rainfall, maximum temperature, and minimum temperature, is regarded as equivalent to +1 should there be a region with >60% probability of the element exceeding the median and no region with <40% probability of the element exceeding the median.

For each state and season, the forecast element is regarded as equivalent to -1 should there be a region with <40% probability of the element exceeding the median and no region with >60% of the element exceeding the median.

For each state and season, all other forecasts are regarded as equivalent to 0.

For each state and season, the observed element is regarded as being equivalent to the element's anomaly in mm (in the case of rainfall) or deg C (in the case of temperature).

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Summary Graphics

The summary graphics shown on the next few slides depict the percent of the observed variance explained by the forecasts since January 2000 (FMA 2000).

The data are depicted on a ‘rolling’ season by season basis, with each season represented by the performance achieved by all forecasts including any month of that season, and also on a state by state basis.

To illustrate, the spring (SON) graphic refers to data associated with all *five* three-month seasons including a spring month, i.e. JAS, ASO,SON, OND, NDJ.

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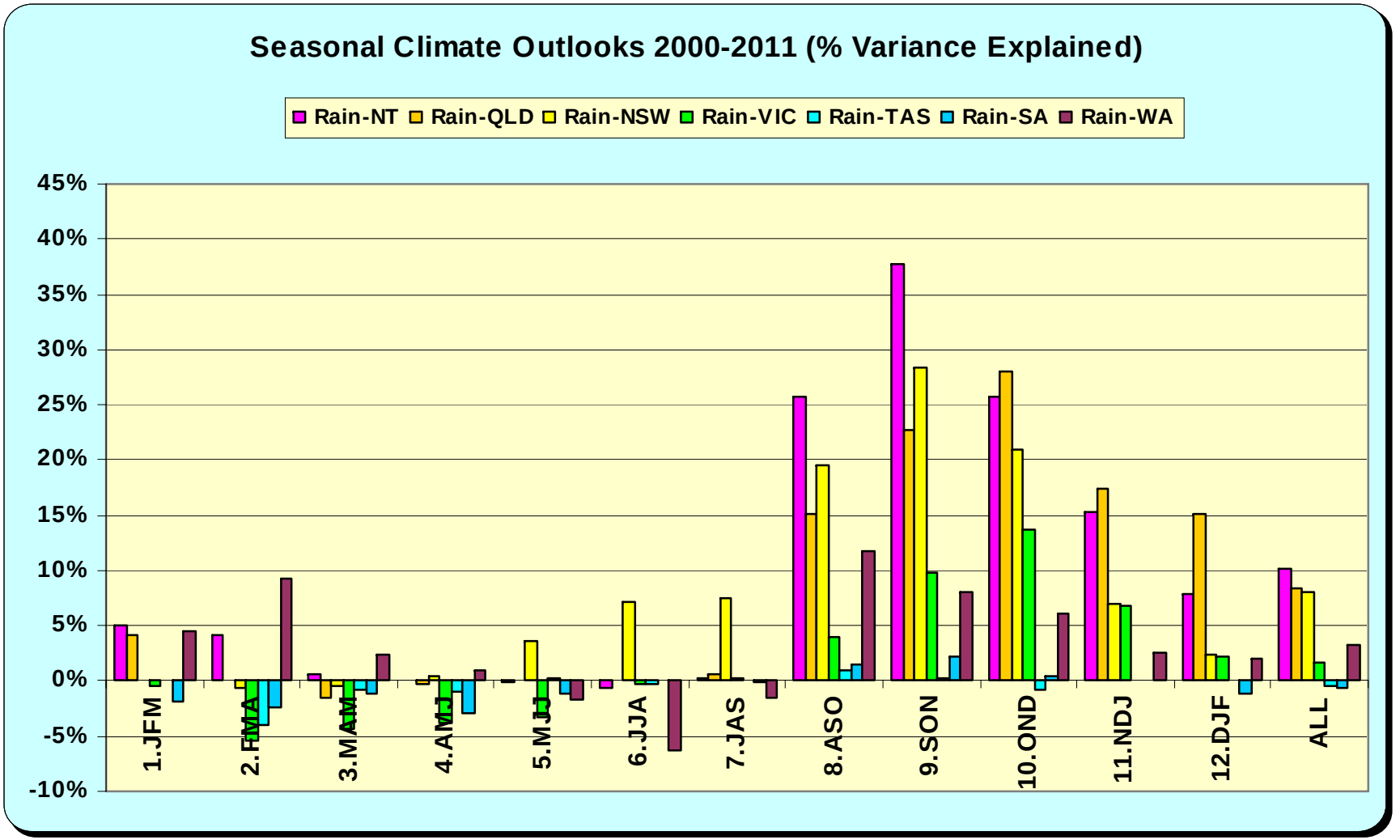
Rainfall



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Rainfall

The graphic shows that rainfall outlooks have displayed accuracy predominantly during the spring half of the year.

The State with the strongest performance is the Northern Territory, with more than 25% of the variance explained in ASO, SON and OND.

This is closely followed by Queensland and New South Wales, with a much weaker but still positive performance evident in the case of rainfall outlooks for Western Australia and Victoria.

Little skill is evident in rainfall outlooks for South Australia and Tasmania.

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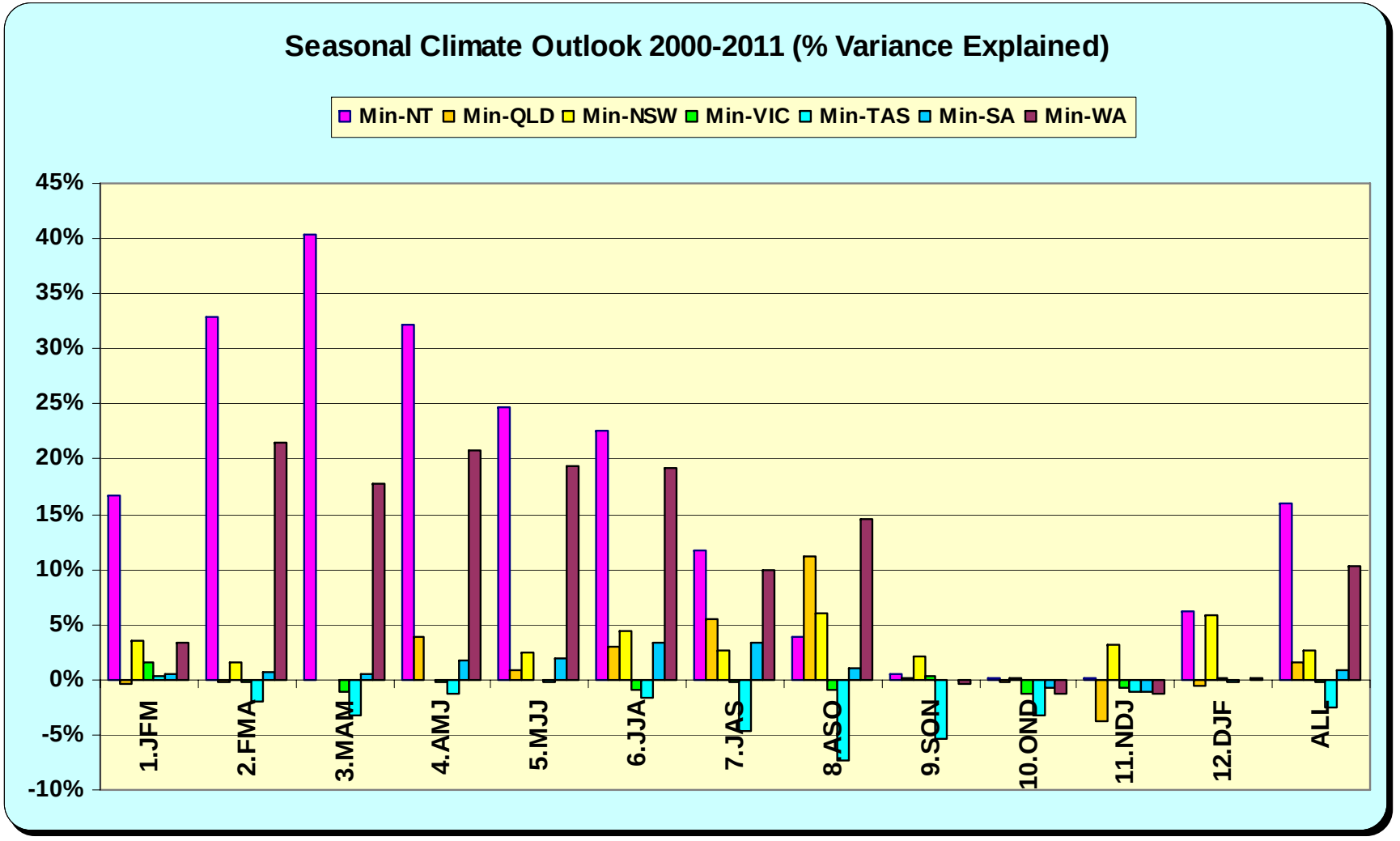
Minimum Temperature



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Minimum Temperature

The graphic shows that minimum temperature outlooks have displayed accuracy predominantly during the autumn half of the year.

As is the case with the rainfall outlooks, the State with the strongest performance is the Northern Territory, with more than 25% of the variance explained in FMA, MAM and AMJ.

This is closely followed by Western Australia.

A much weaker but still positive performance is evident in the case of minimum temperature outlooks for New South Wales, Queensland and Western Australia.

Little skill is evident in minimum temperature outlooks for Victoria and Tasmania.

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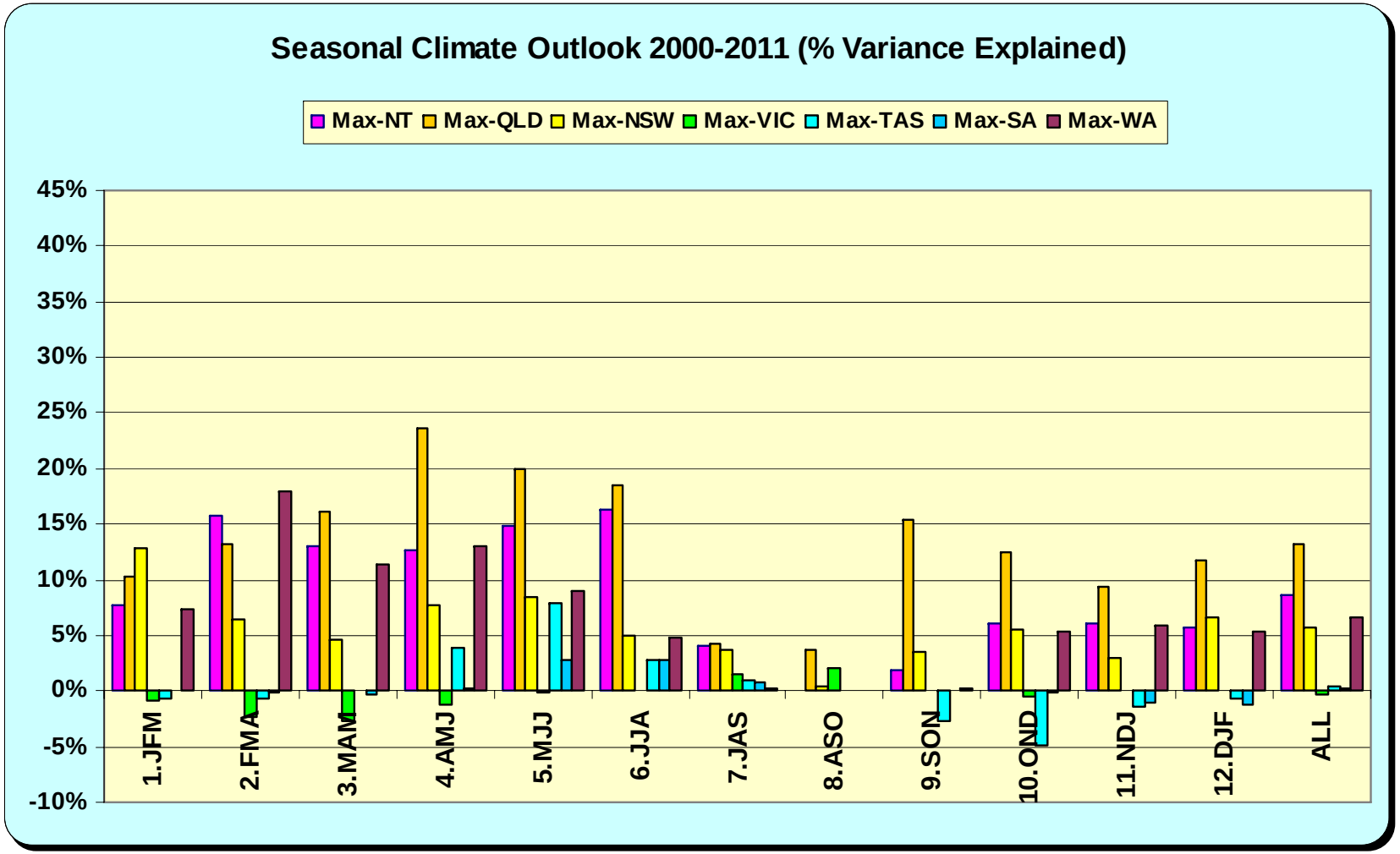
Maximum Temperature



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Maximum Temperature

The graphic shows that maximum temperature outlooks have displayed some skill at most times of the year, the exception being late winter/early spring .

The States with the strongest performances are Queensland, Northern Territory, Western Australia and New South Wales.

Little skill is displayed by the maximum temperature outlooks for the other states – Victoria, Tasmania and South Australia.

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Annual & Monthly

The thirteen graphics following depict the percent of the observed variance explained by the forecasts since January 2000 (FMA 2000), annual plus on a 'rolling' season by season basis, and also on a state by state basis.

Each season is represented by the performance achieved by all forecasts including any month of that season.

To illustrate, the spring (SON) graphic refers to data associated with all *five* three-month seasons including a spring month, i.e. JAS, ASO,SON, OND, NDJ.

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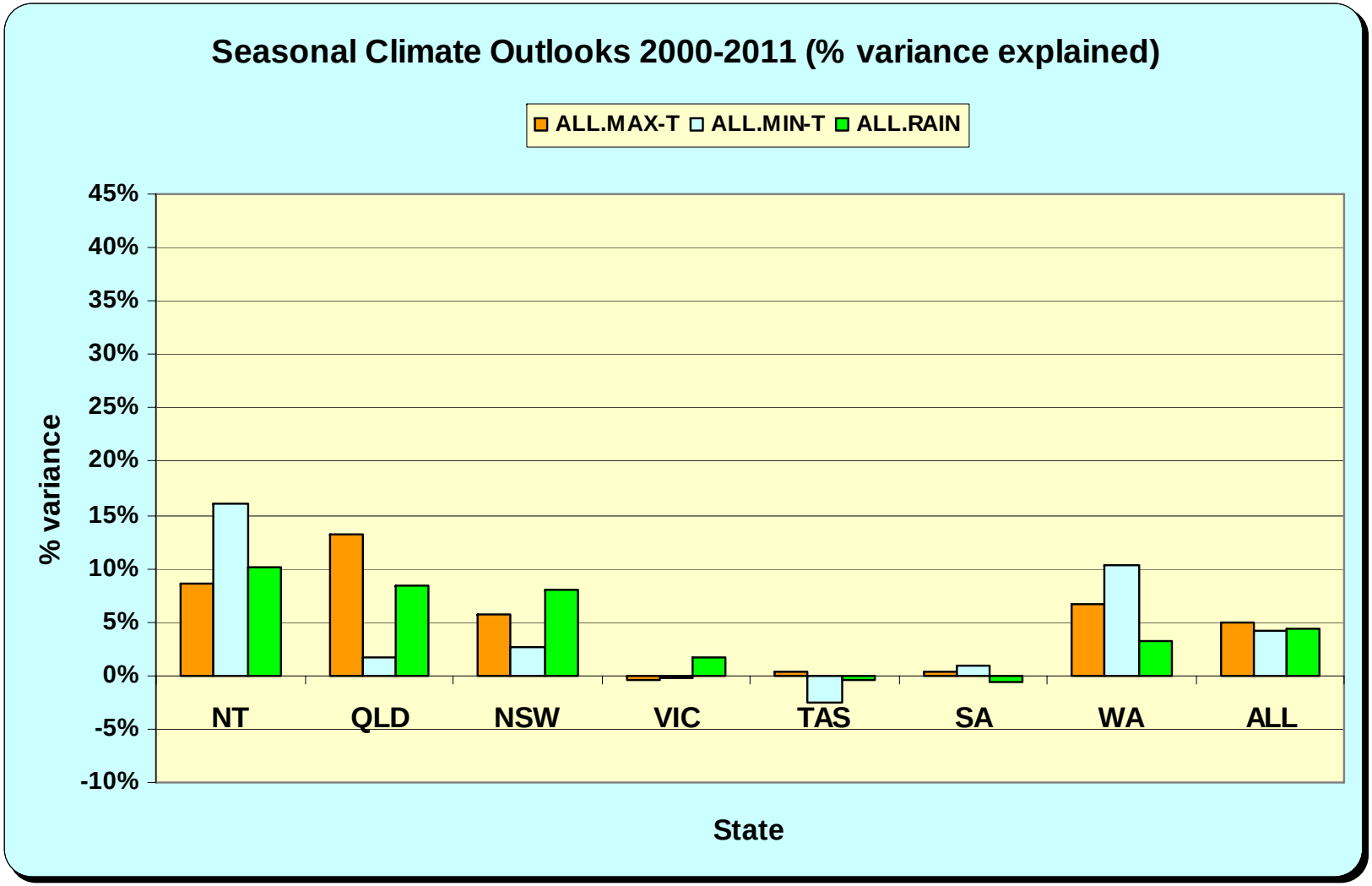
Annual



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Annual

The graphic shows that the outlooks have displayed some overall skill across the year in the case of predictions for most states.

The best rainfall outlooks are for Northern Territory, Queensland and New South Wales, the best minimum temperature outlooks are for Northern Territory and Western Australia whilst the best maximum temperature outlooks are for Queensland, Northern Territory, Western Australia and New South Wales.

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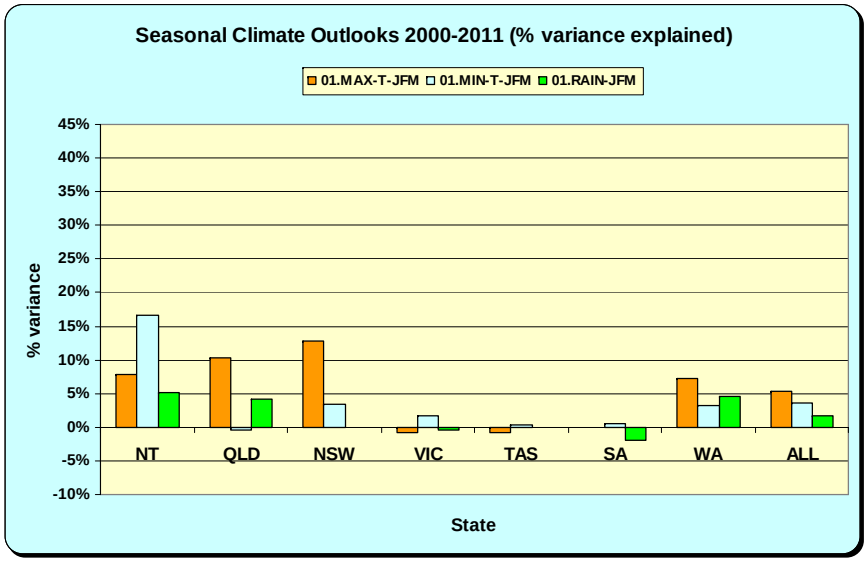
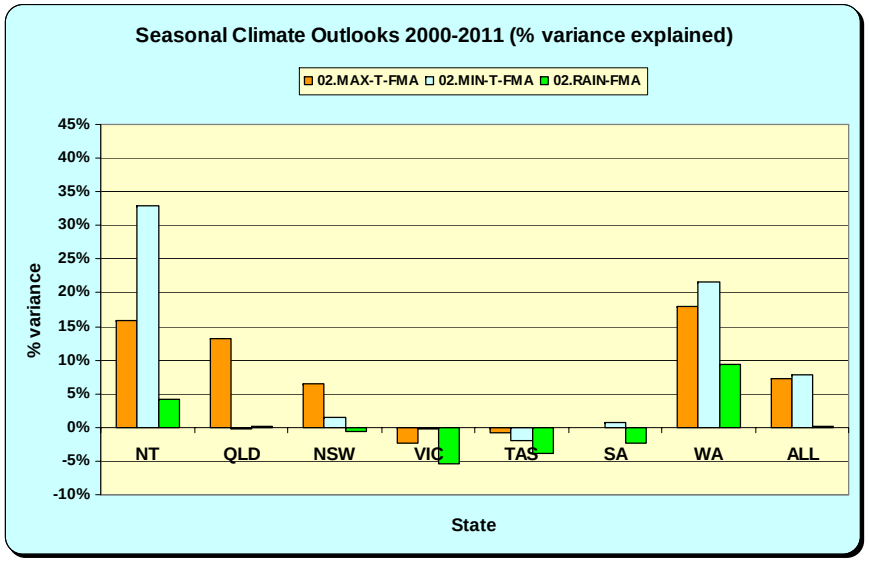
JFM/FMA





The graphic shows that during the early part of the year, whilst the rainfall outlook have limited skill, notable skill is observed in the case of some of the temperature outlooks, especially the minimum temperature outlooks for the Northern Territory, and the maximum temperature outlooks for the Northern Territory, Queensland, New South Wales and Western Australia.

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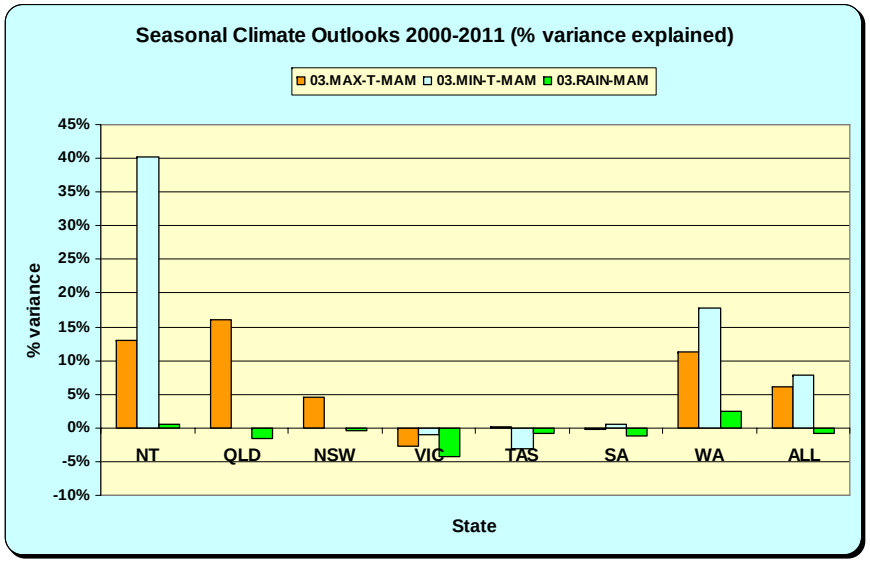
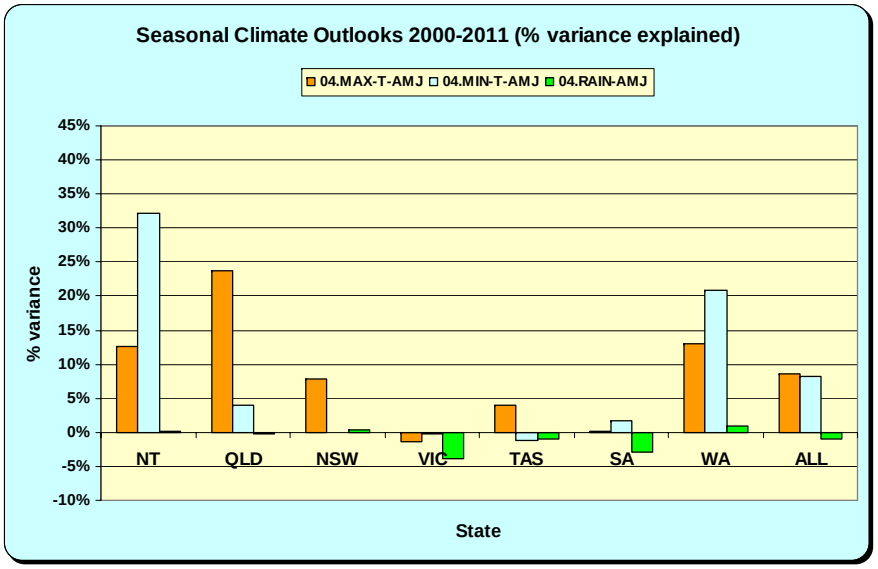
MAM/AMJ





As one moves through the autumn months, the skill of the rainfall outlooks all but disappears. However, the skill at predicting temperature increases, especially for the Northern Territory and Western Australia.

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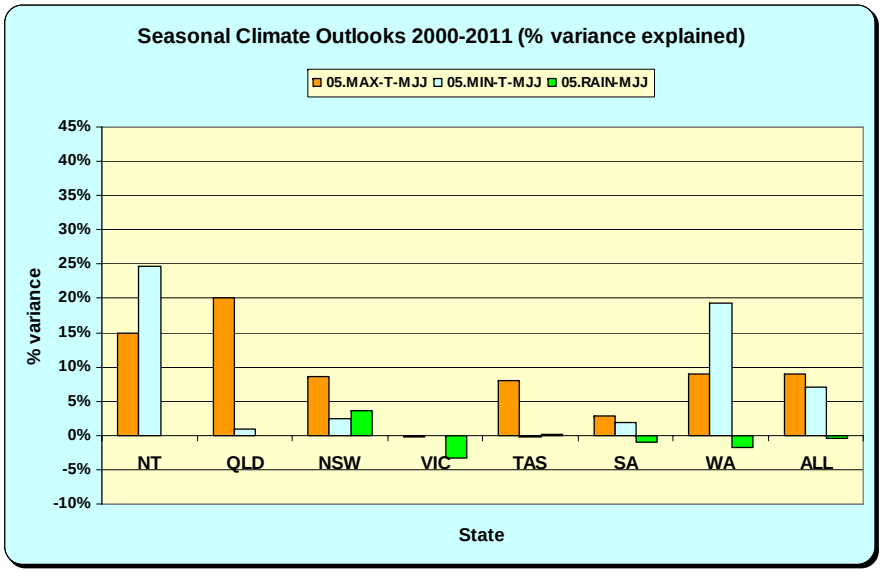
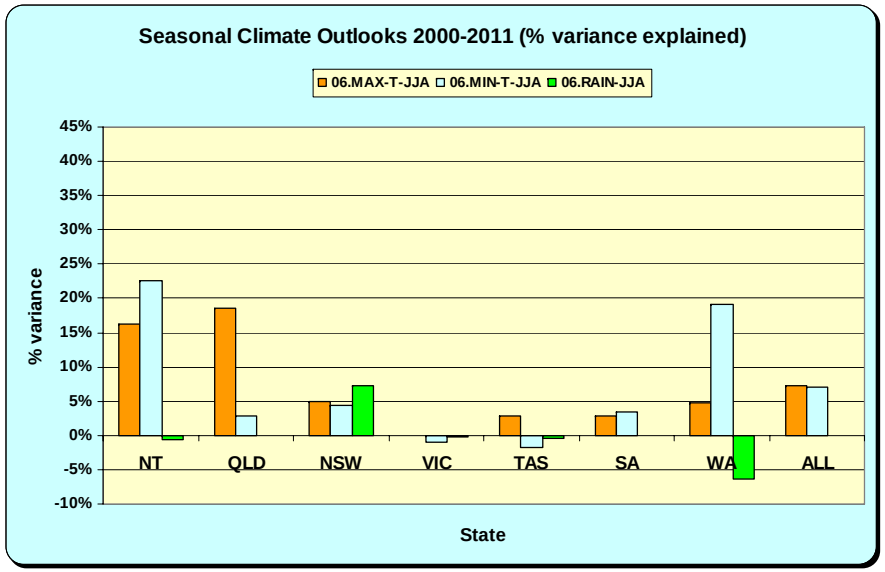
MJJ/JJA





Through autumn and into the early part of winter, the skill of the rainfall outlooks continues to be negligible with the exception of the predictions for New South Wales. However, the skill at predicting temperature continues to be good, especially for the prediction of minimum and maximum temperature in the Northern Territory, minimum temperature in Western Australia and maximum temperature in Queensland.

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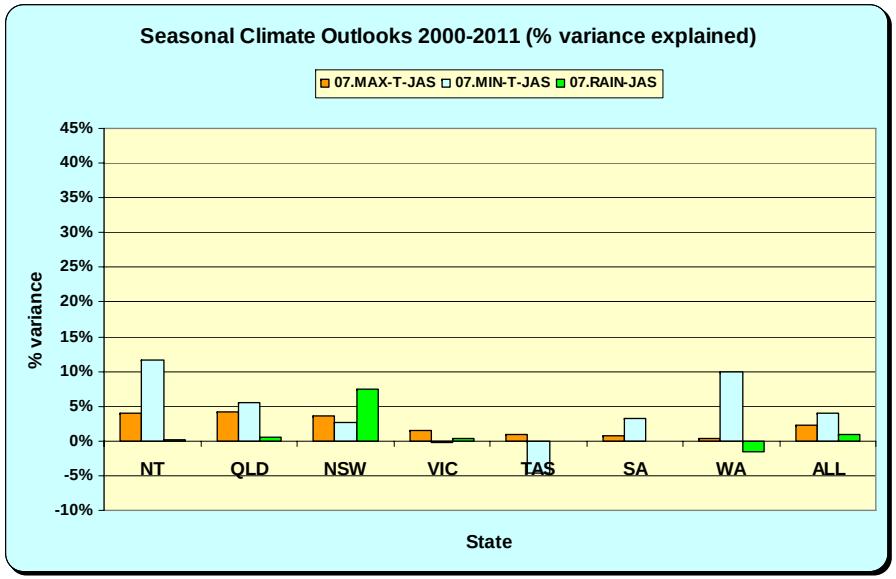
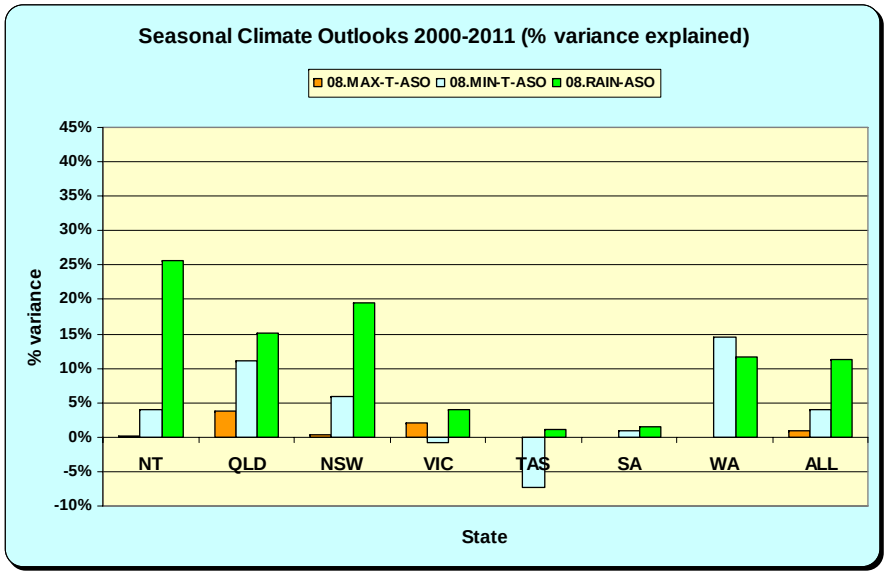
JAS/ASO





As we move into spring, the skill at forecasting seasonal rainfall dramatically increases in many states, especially for the Northern Territory, New South Wales, Queensland, Western Australia and, to a lesser extent, for Victoria.

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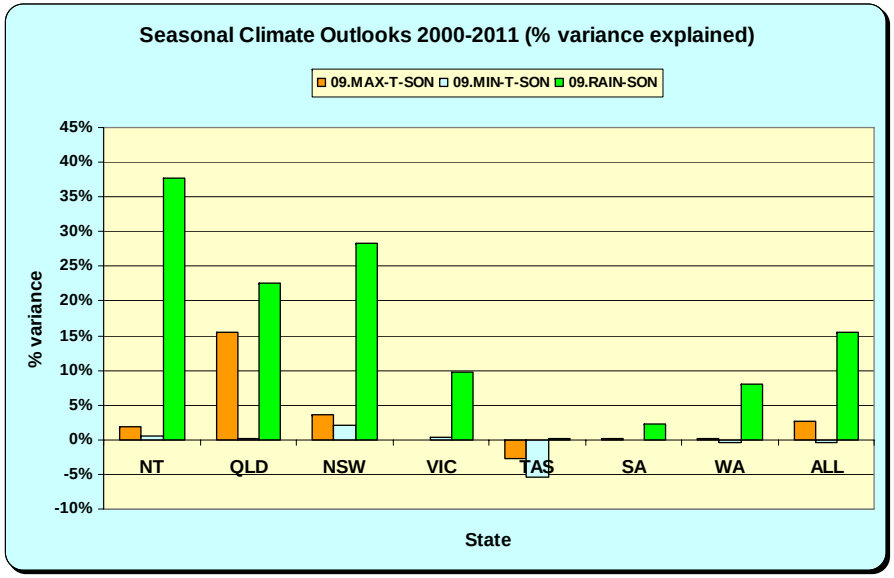
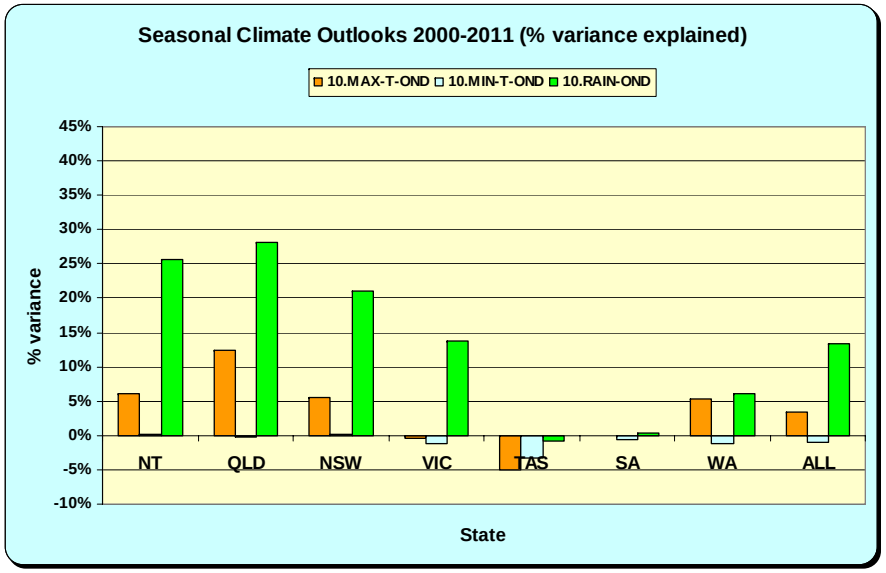
SON/OND





Through spring and early summer, the skill at forecasting seasonal rainfall remains high in many states, especially for the Northern Territory, New South Wales, Queensland, Victoria and Western Australia.

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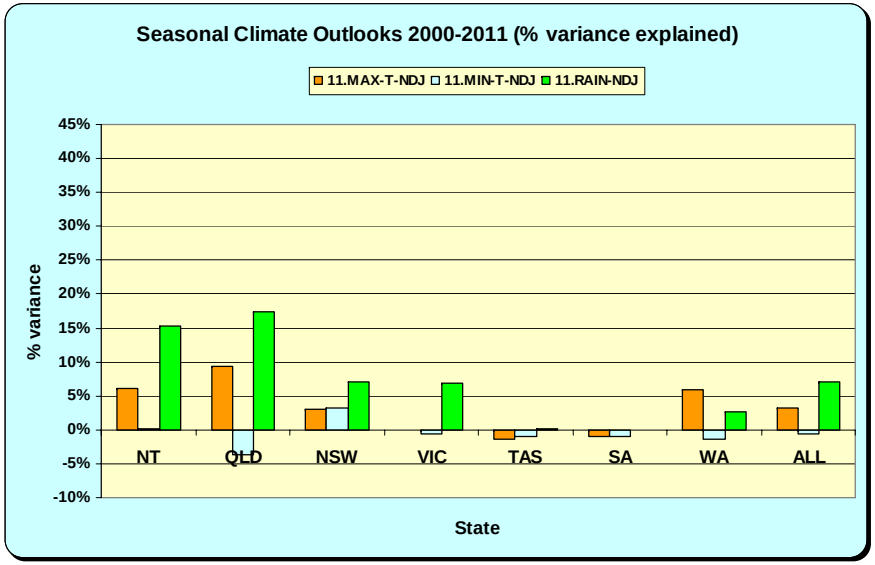
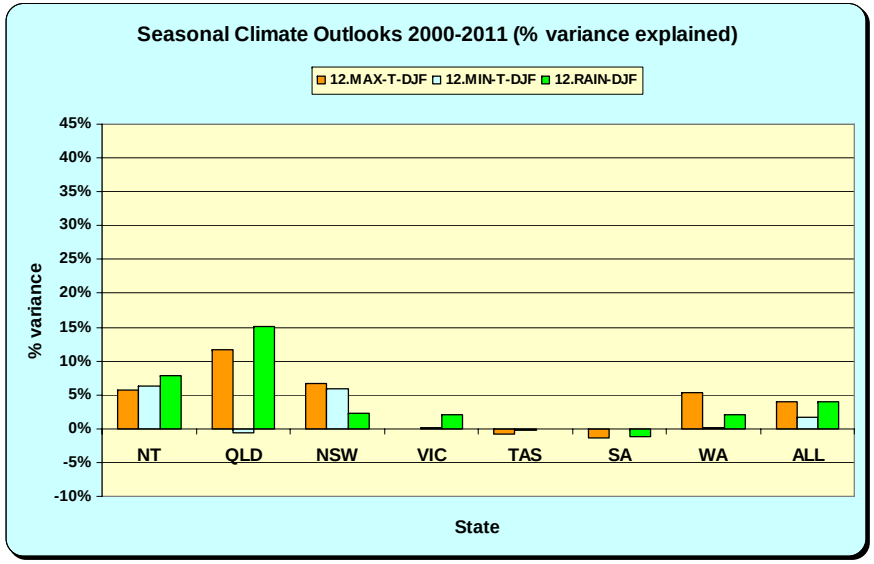
NDJ/DJF





Into summer, and the skill at forecasting seasonal rainfall begins to decline, but maximum temperature forecasts remain skillful in Queensland , Northern Territory and Western Australia.

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Trends

Trends in the accuracy of the seasonal forecasts appear to be vary in concert with corresponding long-term variations in the strength of the relationship between predictors and the predictands.

The following graphics illustrate this feature for rainfall outlooks.

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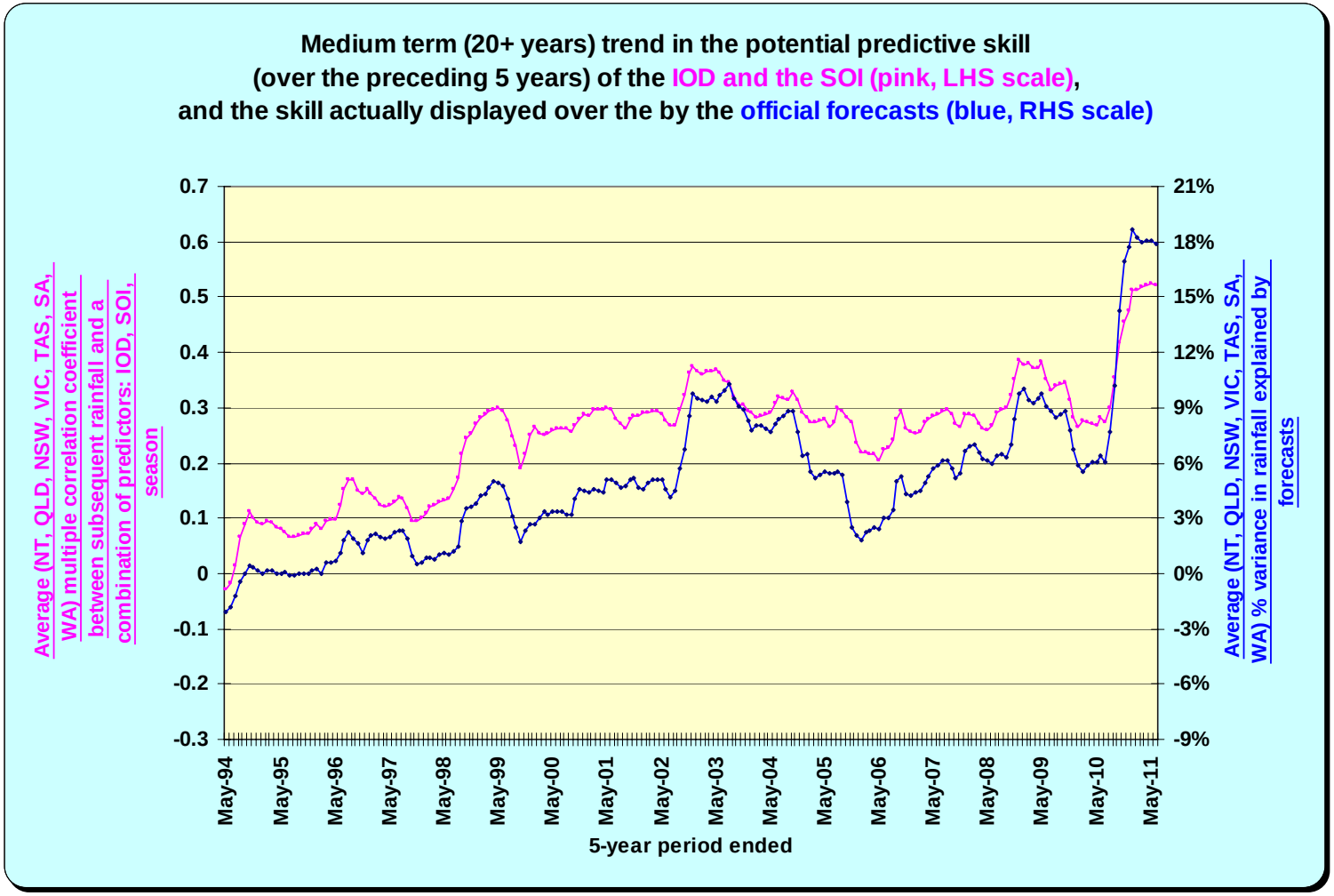
Medium term trends



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Medium term trends

The graphic shows that the skill of the rainfall outlooks during the early 1990s was close to zero, but this period also corresponded to a period when the relationship between seasonal rainfall and its predictors was weak (multiple correlation coefficients between predictors and observed rainfall also being close to zero).

The graphic shows that there was a peak in the skill displayed during the early 2000s (% variance explained ~ 10%), this period corresponding to a period when the relationship between seasonal rainfall and its predictors being strong (multiple correlation coefficients between predictors and observed rainfall ~ +0.3).

The strongest performance was registered during recent years (% variance explained being nearly 20%), when the strength of the relationship also peaked ((multiple correlation coefficients between predictors and observed rainfall ~ +0.5).

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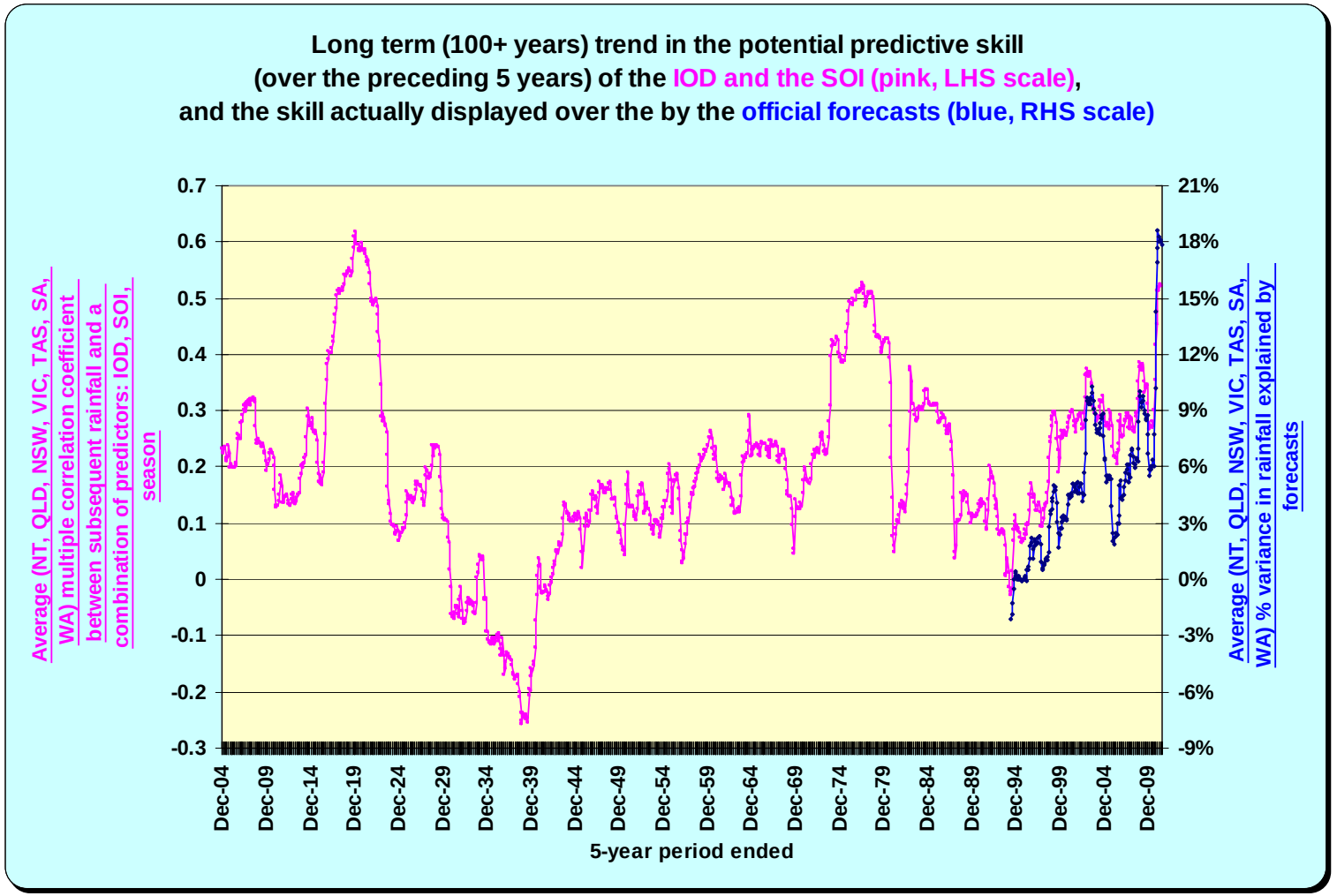
Long term trends



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Long term trends

Looking back over more than 100 years, it may be seen that there have been two periods, in addition to the most recent one, when the relationship between seasonal rainfall and its predictors was strong (multiple correlation coefficients between predictors and observed rainfall being close to +0.5).

It may be suggested that it is no coincidence that the first of these periods (*circa* 1920) precipitated the early work into seasonal forecasting by Quayle and others.

It also may be suggested that the reason interest in this work subsequently declined was the weakness in the relationship between seasonal rainfall and its predictors during the decades following.

The revitalisation of interest by McBride, Nicholls and others during the 1980s follows the peak in the skill displayed by the relationship during the 1970s.

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Thank You

Any Questions?