

# The influence of ENSO on Frost Risk in eastern and south-eastern Australia

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## Data

The minimum temperature data used in this analysis was patched point data from the Bureau of Meteorology's SILO website. This daily data consists of original measurements from a particular meteorological station, along with interpolated data used to fill any gaps in the observational record. Data from 1900-2005 was analysed for the following stations: Emerald and Goondiwindi (Qld); Gunnedah, Wagga Wagga and Deniliquin (NSW); Mildura and Nhill (Vic); and Snowtown (SA).

Where ENSO is concerned, we have used a list provided by the Bureau of Meteorology. Any year that does not appear as El Nino or La Nina between 1900 and 2005 in the following list was classified as a Neutral year by the Bureau.

El Nino	La Nina
1902	1903
1905	1906
1911	1909
1913	1910
1914	1916
1919	1917
1925	1924
1940	1928
1941	1938
1946	1950
1952	1955
1953	1956
1959	1964
1965	1970
1969	1971
1972	1973
1977	1974
1982	1975
1987	1988
1991	1996
1993	1998
1994	
1997	
2002	

## Graphs

There are three series of graphs in this document. The first shows the probability of there being a particular number of days of frost (minimum temperature less than 2 degrees C measured at Stevenson screen height) per year at the site throughout the historical record from 1900 to 2005. Also shown is the resulting probability curve from using only El Nino, La Nina or Neutral years, as well as the curve created from the last 20 years of data.

The next set of graphs shows the probability that the last frost each year has occurred by the given date. Again, the probability curves from the three ENSO classifications are shown as well as the last 20 years. The final set of graphs show the same thing except a frost is now defined as getting a minimum temperature less than 0 degrees C.

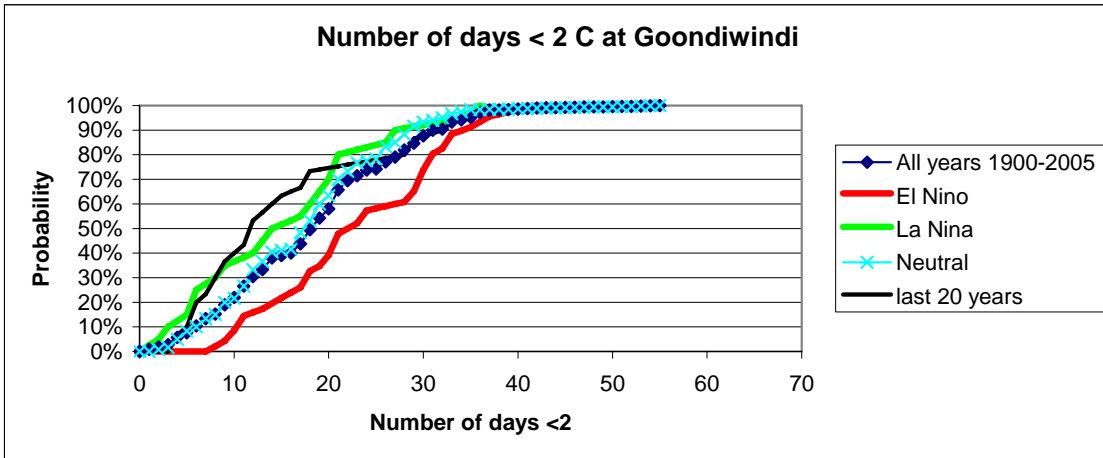
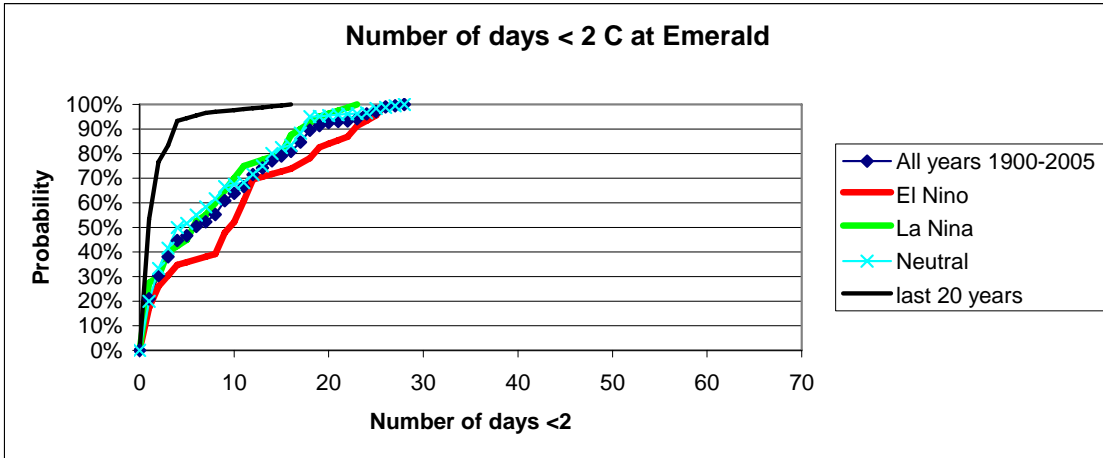
## Discussion

If we look at the first series of graphs you can see that quite often there are more frost days in El Nino years compared to La Nina years. For example, at Wagga Wagga in a La Nina year, 50% of the time there are over 33 frost days, whereas in an El Nino year, 50% of the time there are over 57 frost days. However, when you look at the graphs showing the date of the latest frosts each year, there is less of a distinction between El Nino and La Nina years.

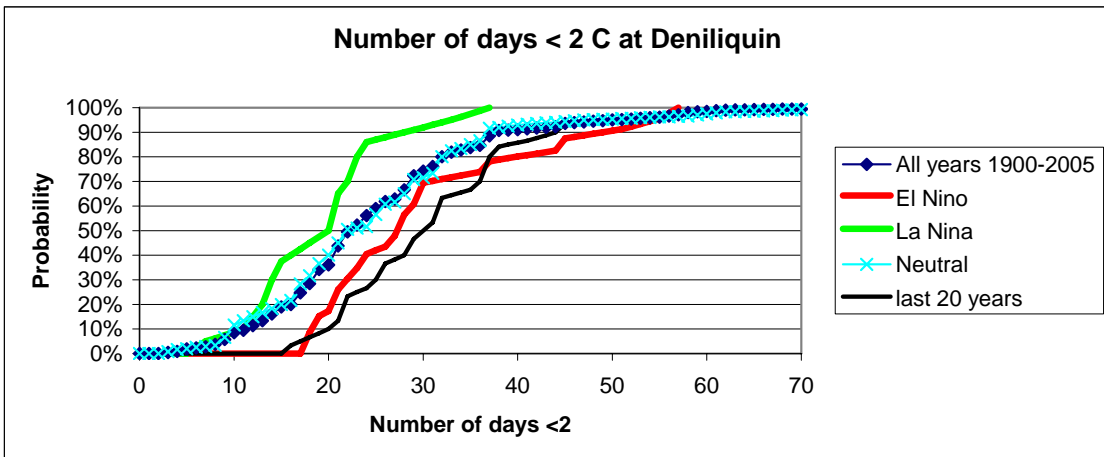
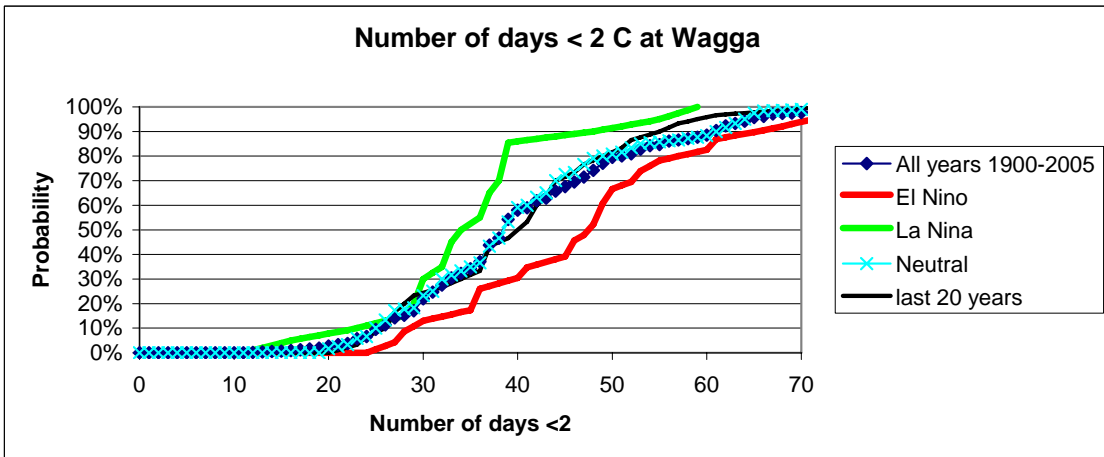
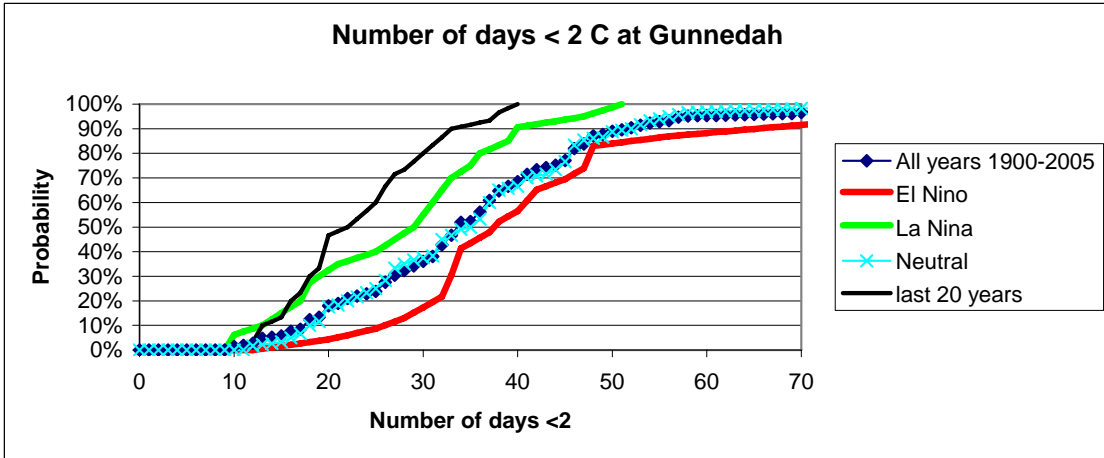
These graphs also show the wide range in the latest date of a frost from year to year. For example, the last frost (<2C) at Snowtown has occurred anywhere between late July to mid November during the last century, highlighting the challenge farmers face of managing frost risk.

# Series 1: The number of days below 2 degrees C

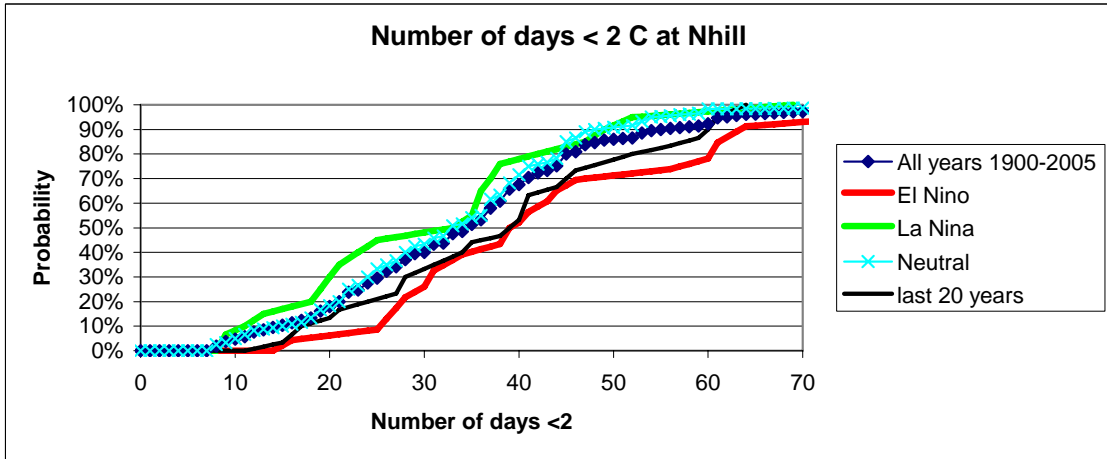
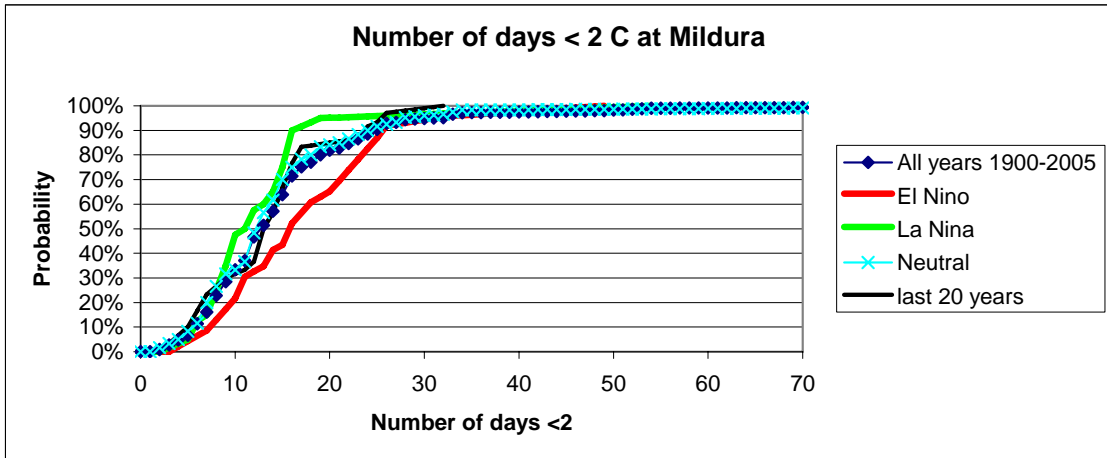
## Queensland



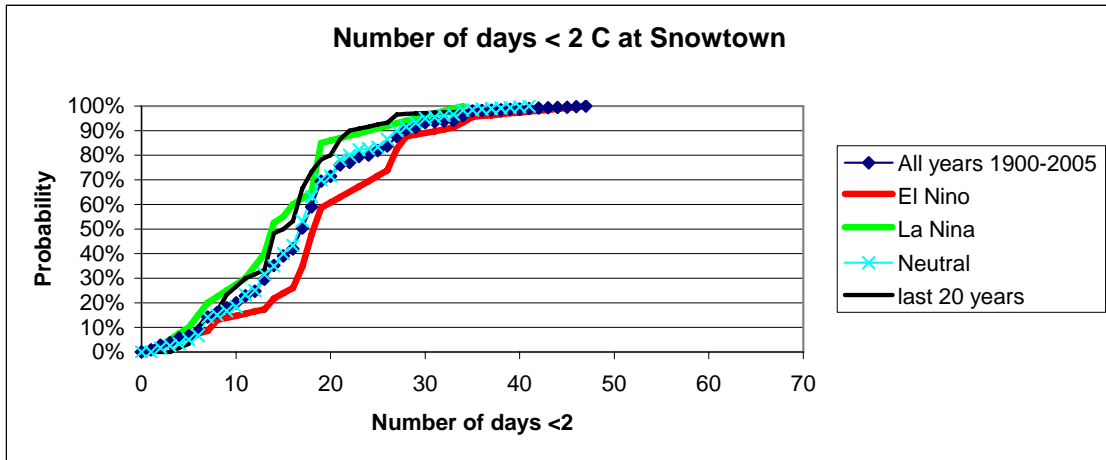
# New South Wales



# Victoria

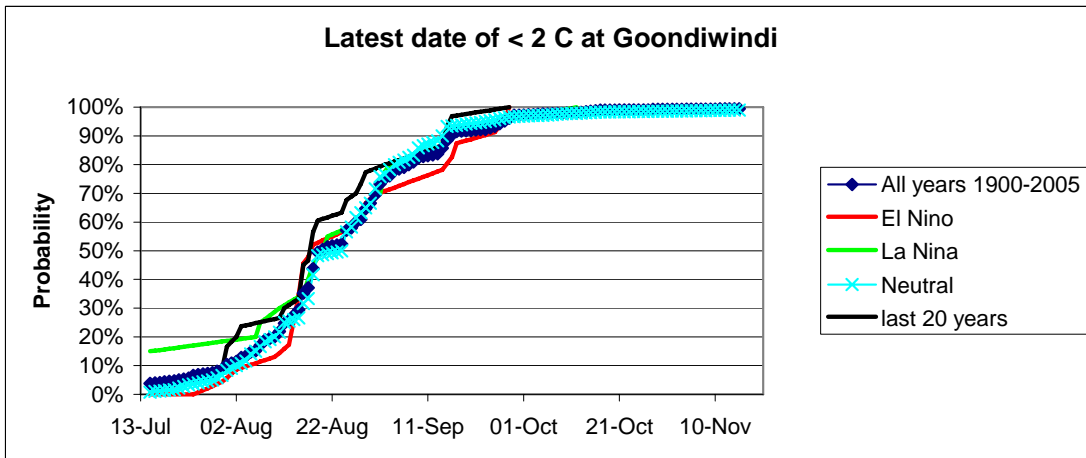
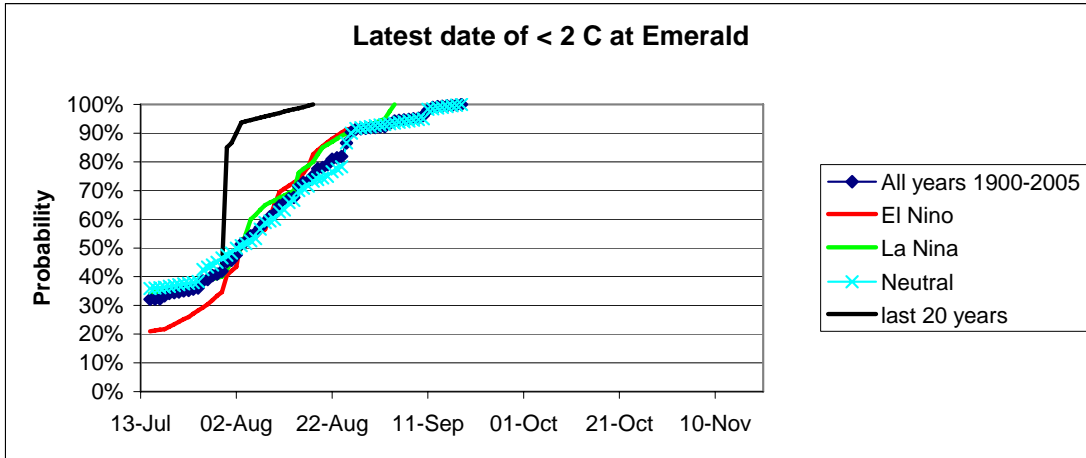


# South Australia

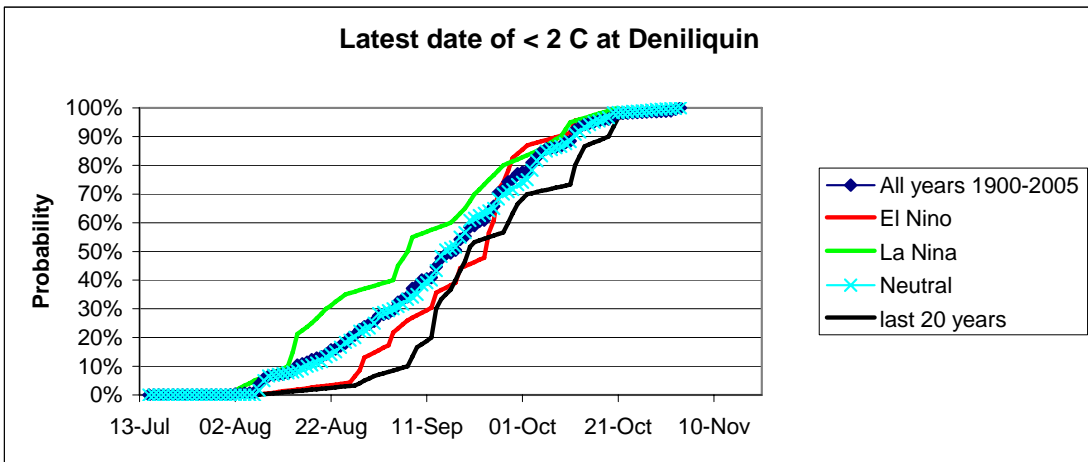
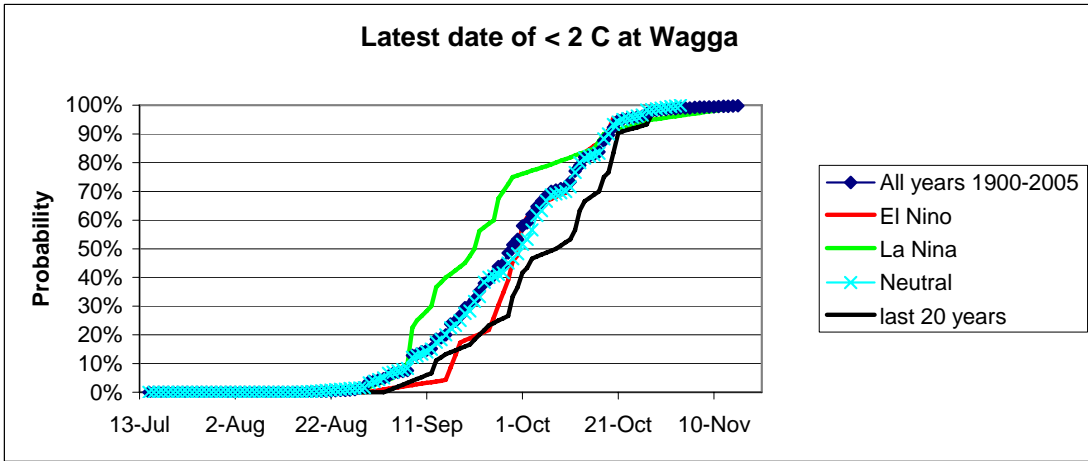
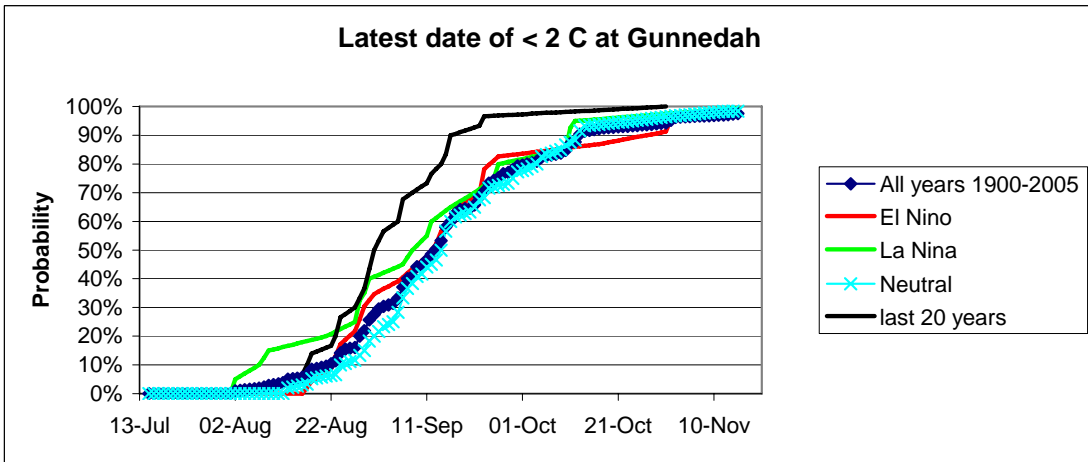


## Series 2: The latest date of less than 2 degrees C

### Queensland

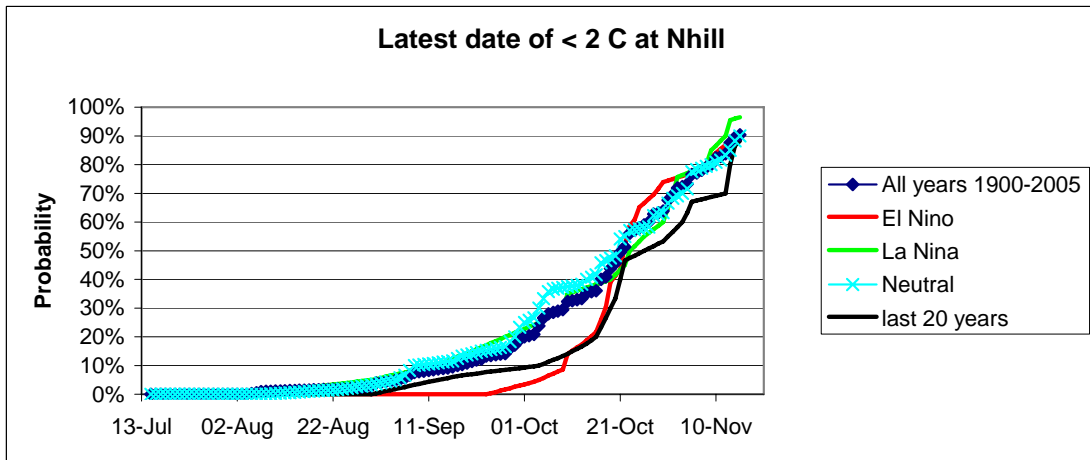
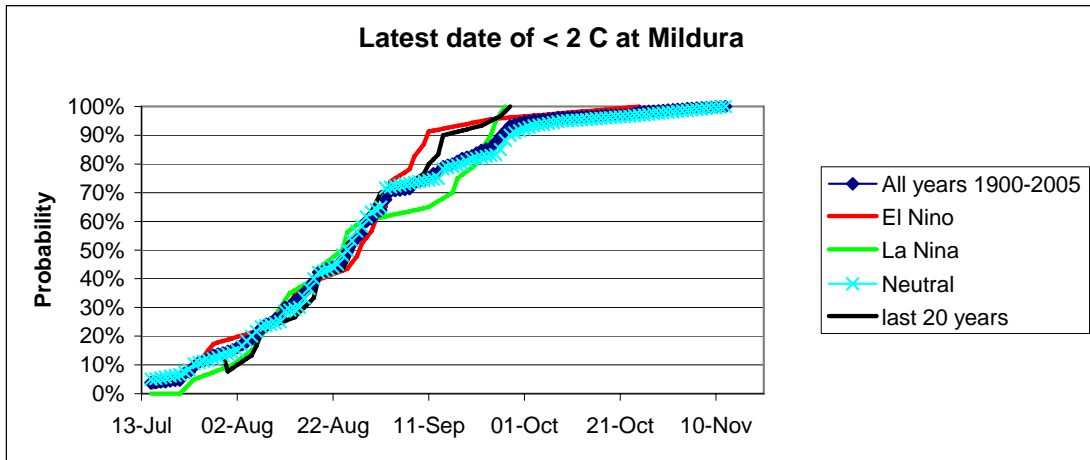


# New South Wales

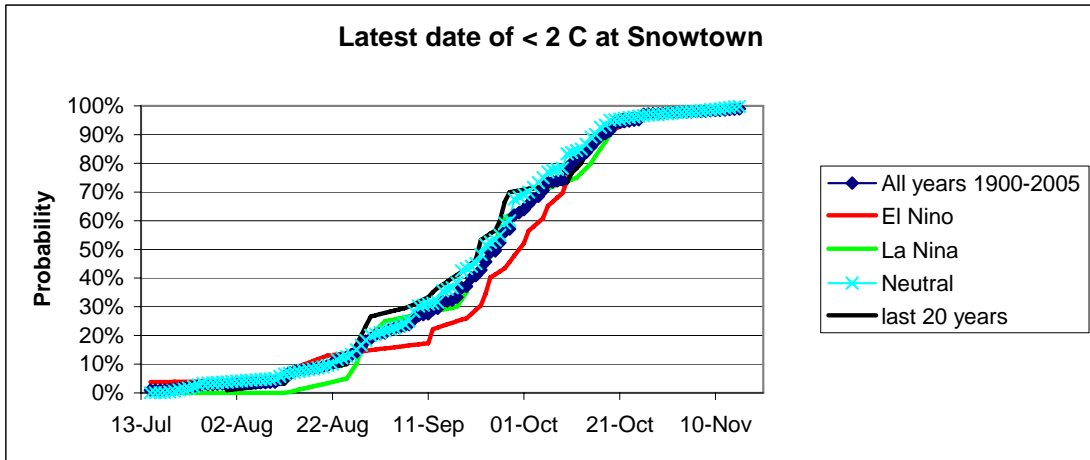




# Victoria

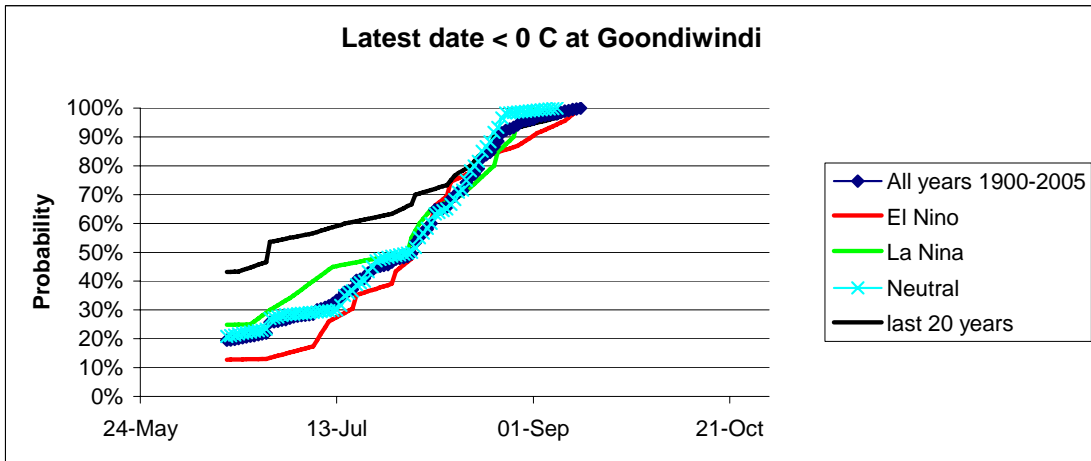
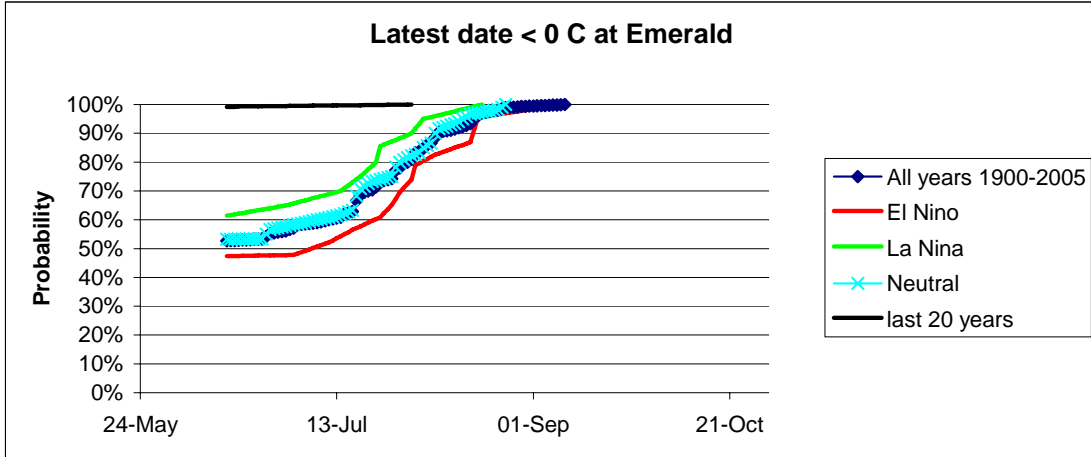


# South Australia

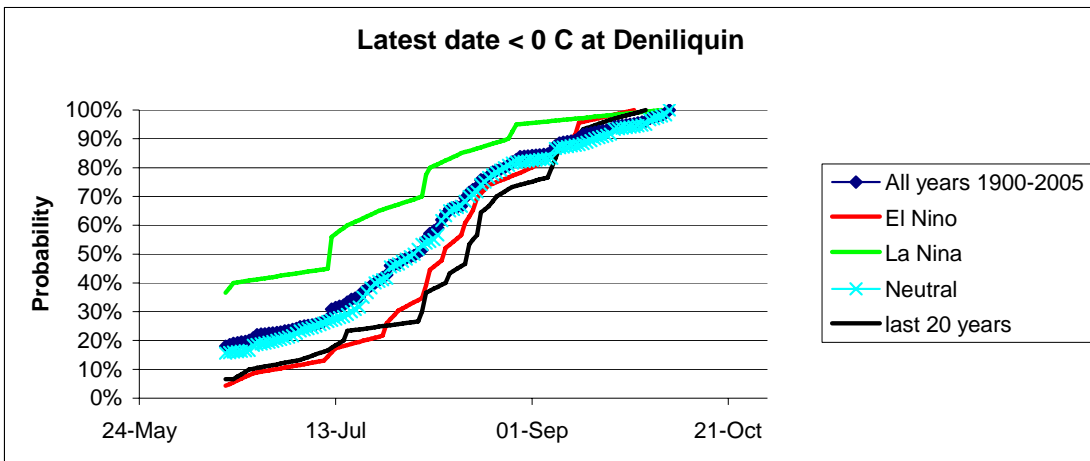
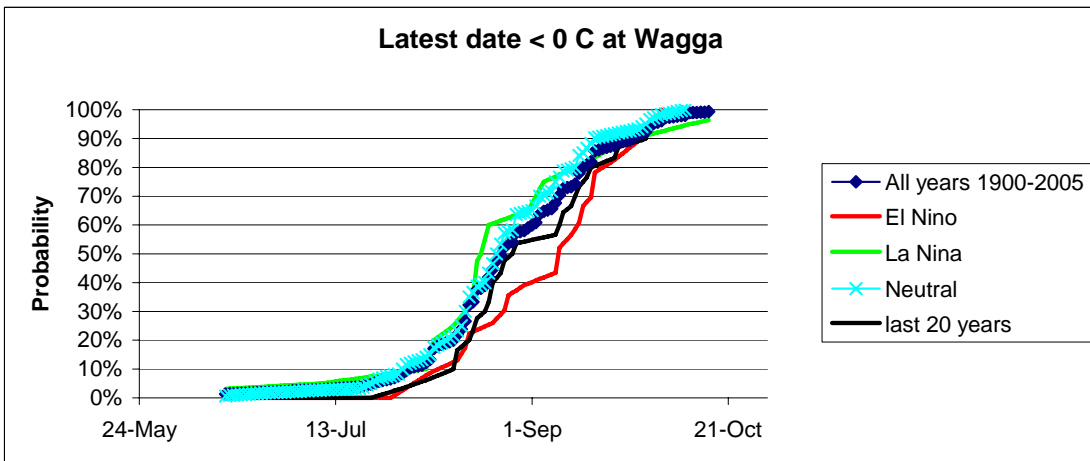
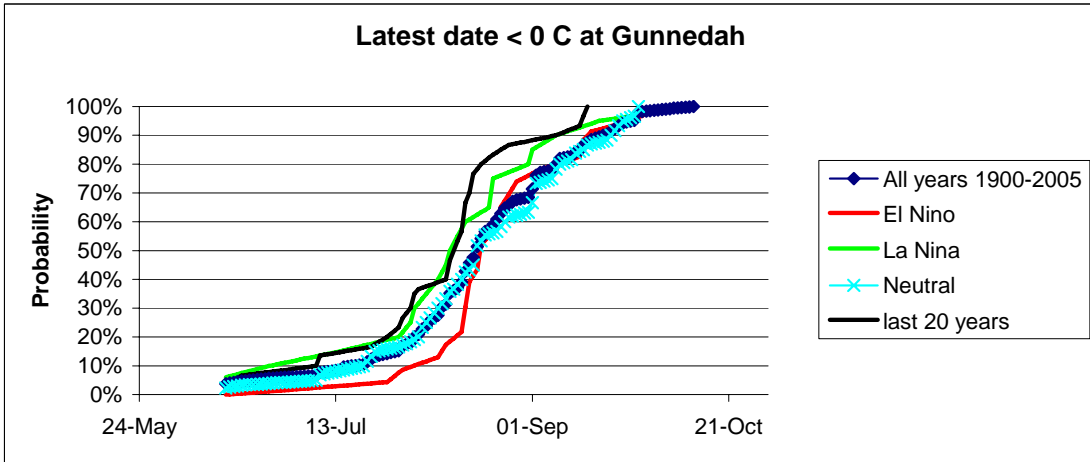


### Series 3: The latest date of less than 0 degrees C

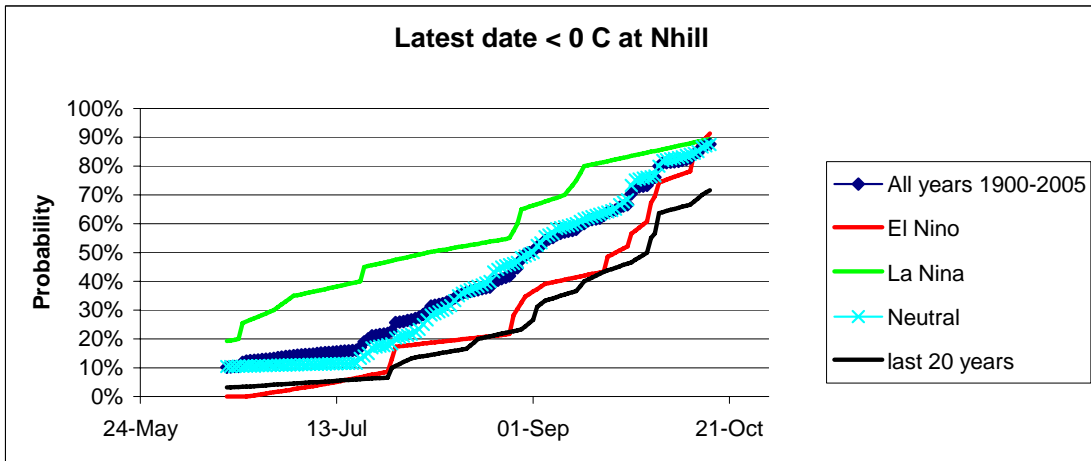
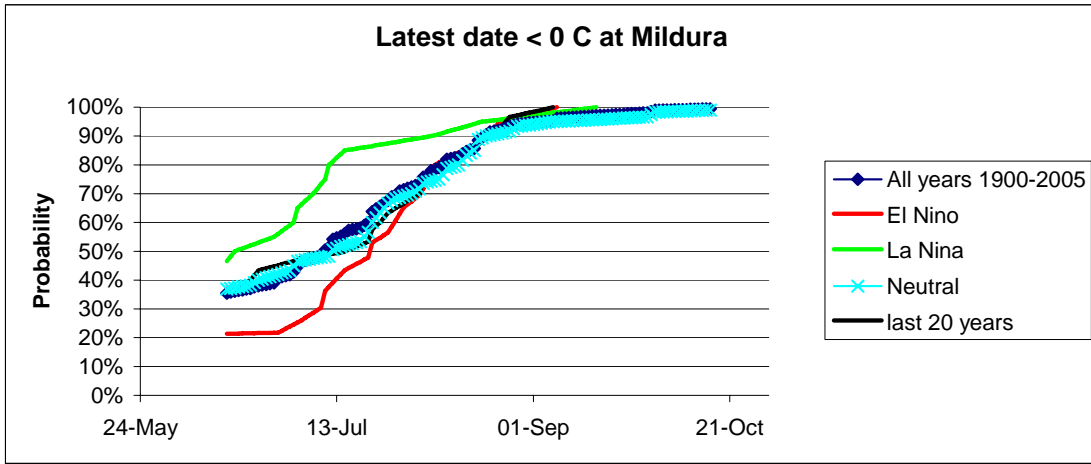
#### Queensland



# New South Wales



# Victoria



# South Australia

