THE AUSTRALIAN NATIONAL UNIVERSITY

Is the Drought Related to Climate Change?

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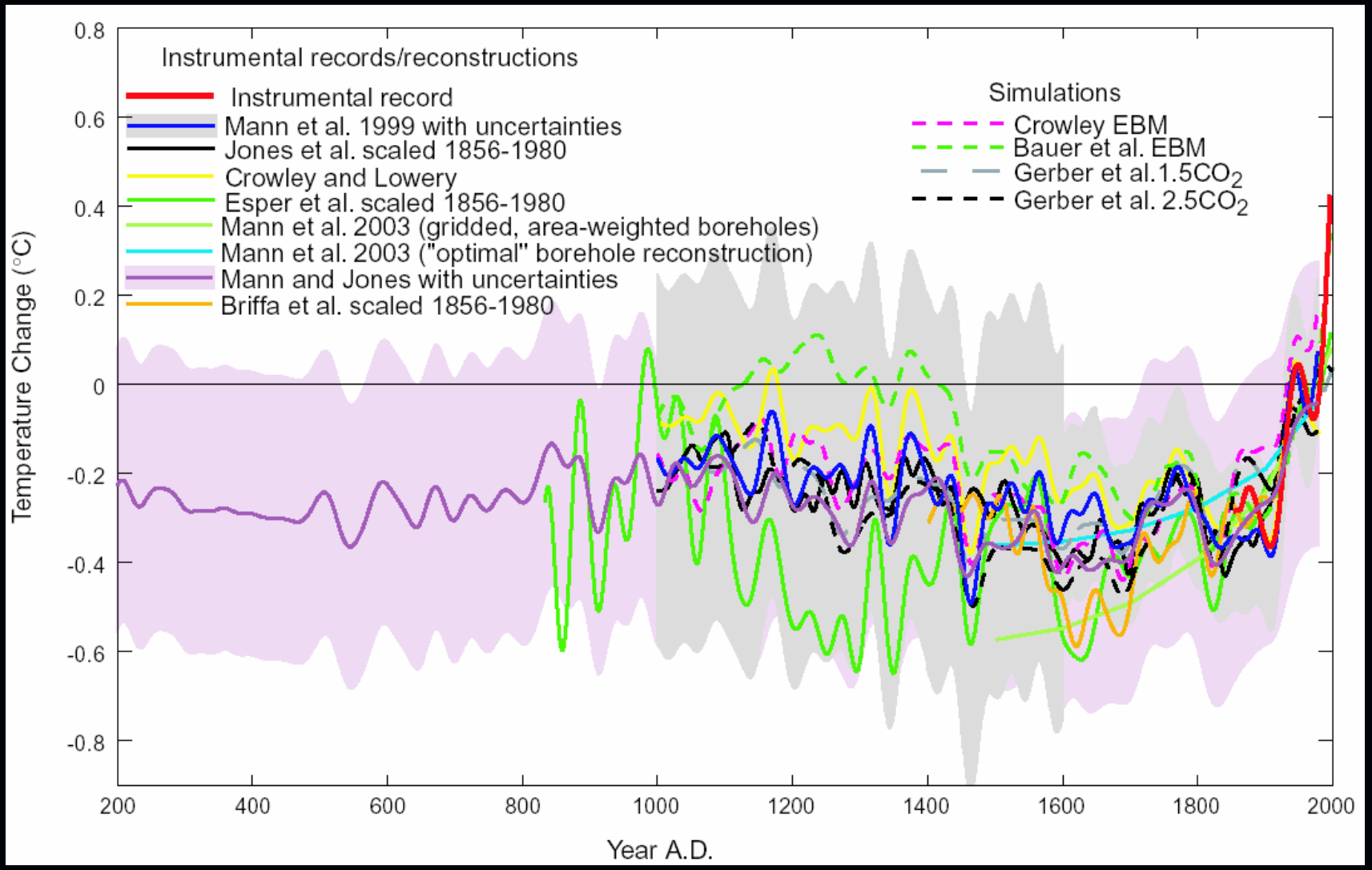
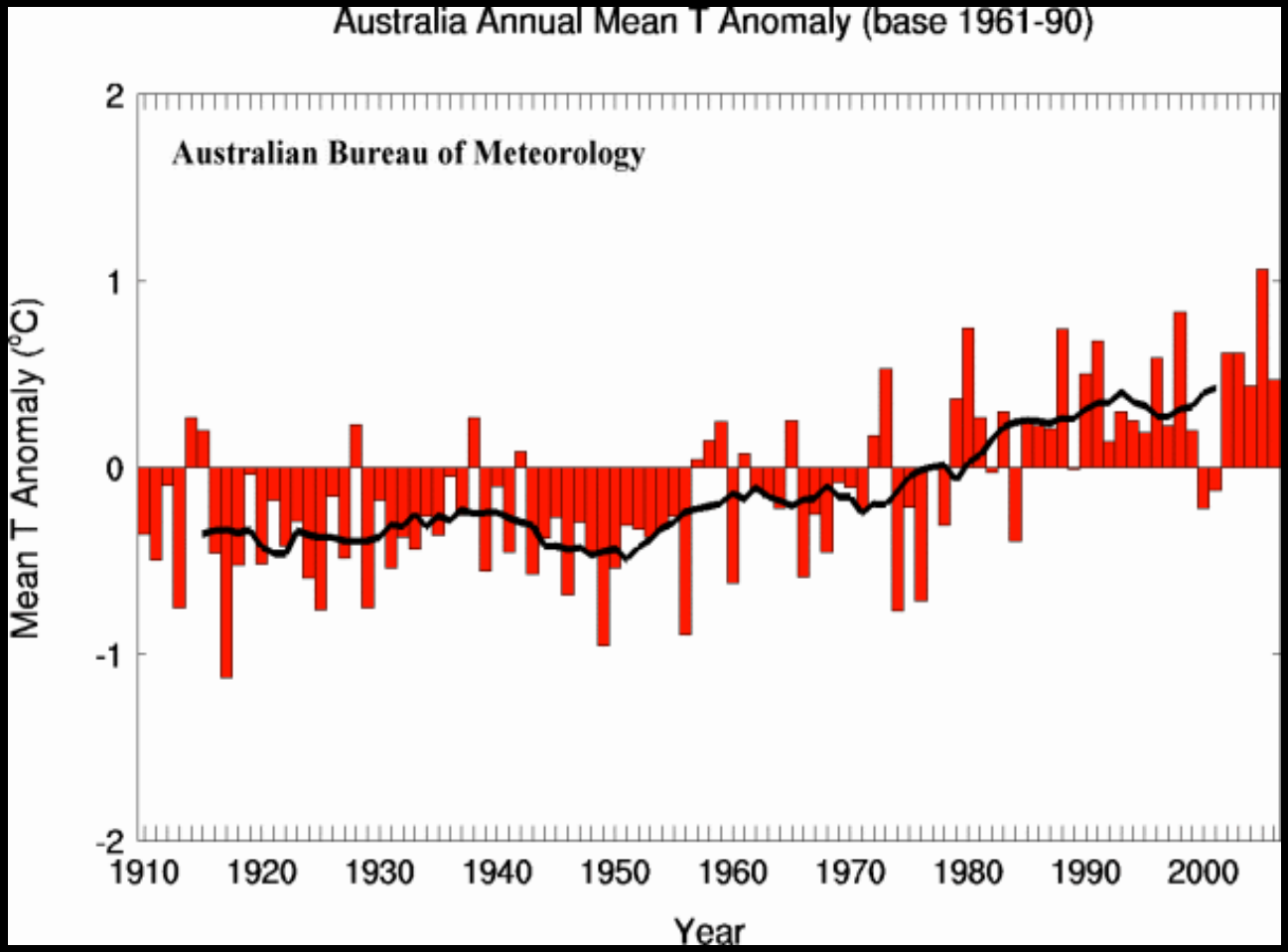
Northern Hemisphere Surface Temperature



Source: Mann et al. 2003 (EOS)

Trend in Australian Mean Temperature



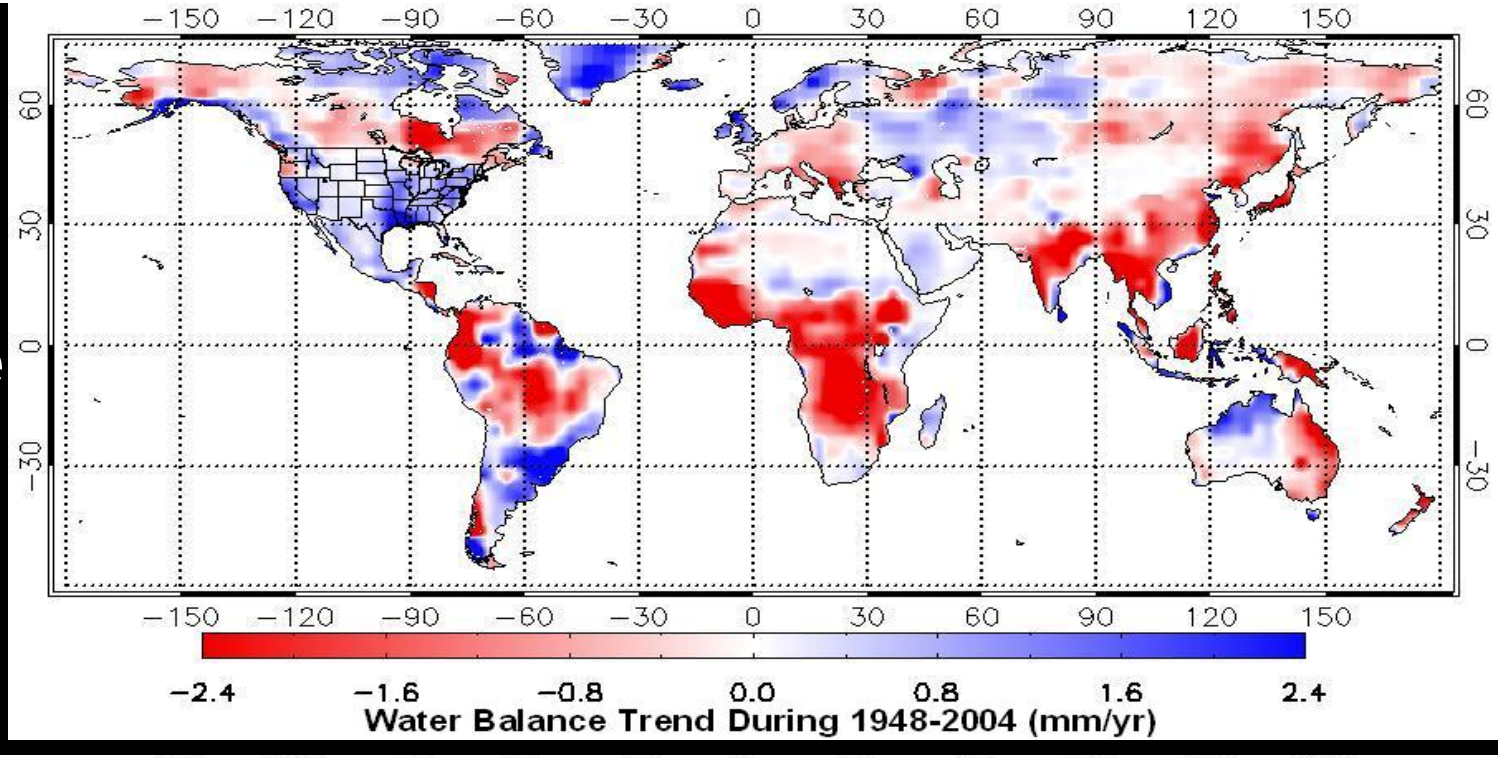
Australian Bureau of Meteorology 2007

Global Drying Trends

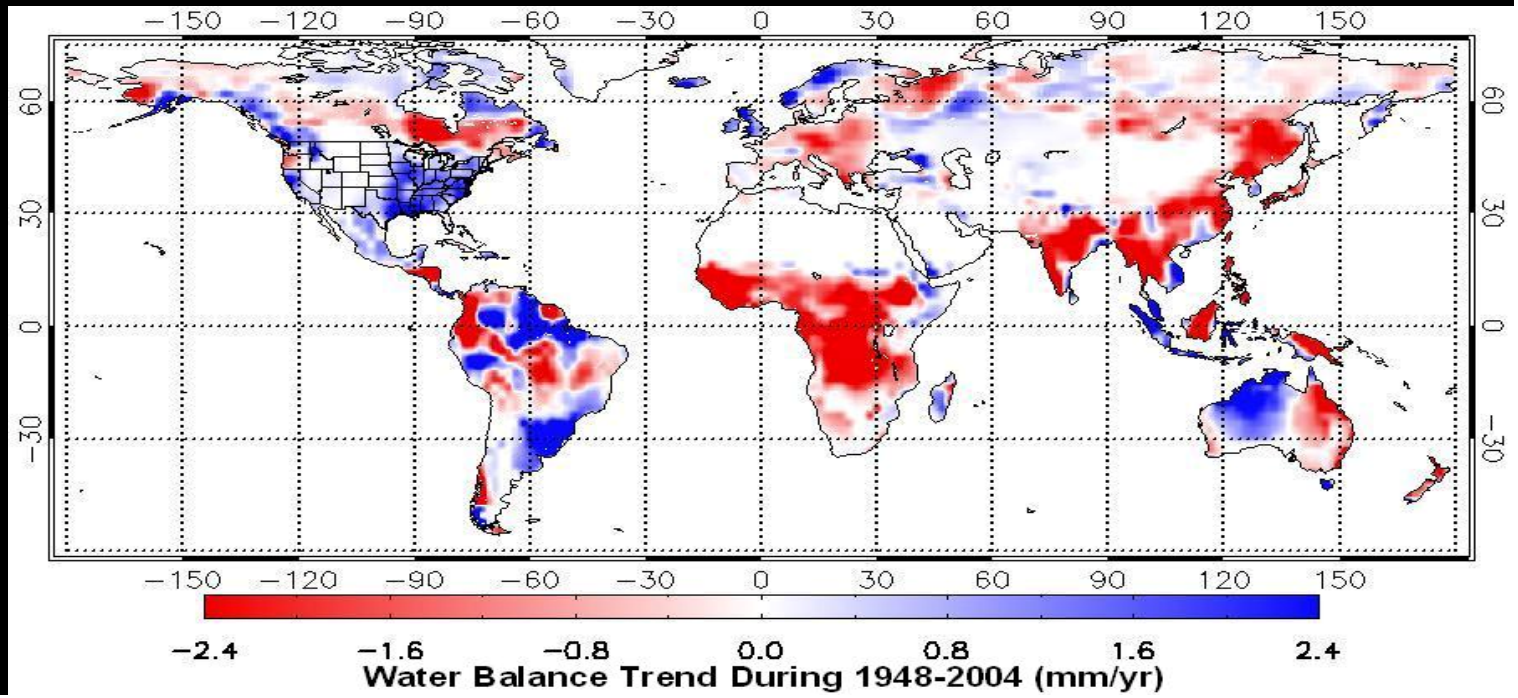
Water Balance = Ppt - ET

NCAR CLM v3.0

Qian, T., A. Dai, K. E. Trenberth, and K. W. Oleson, 2006. J. Hydrometeorology



BIOME-BGC

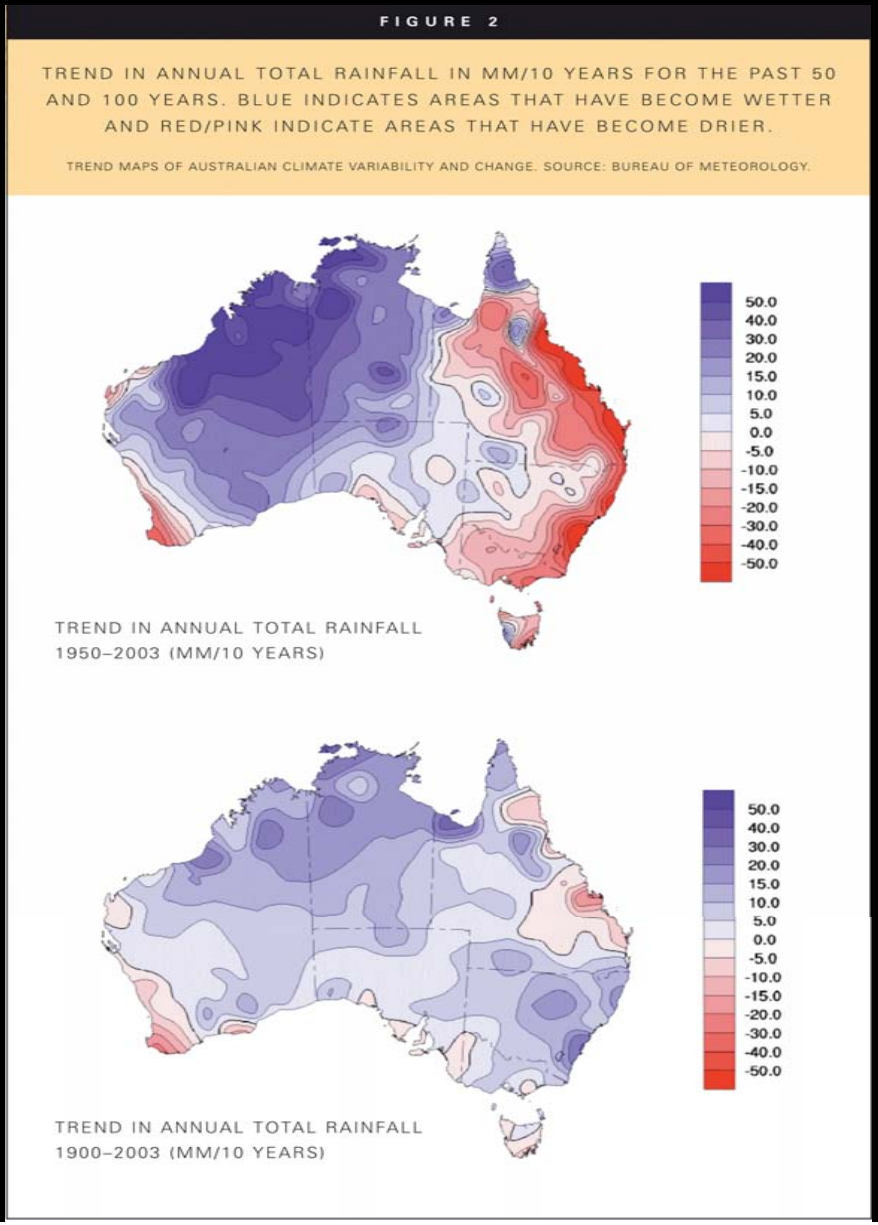


The 50-year drying trend in eastern Australia

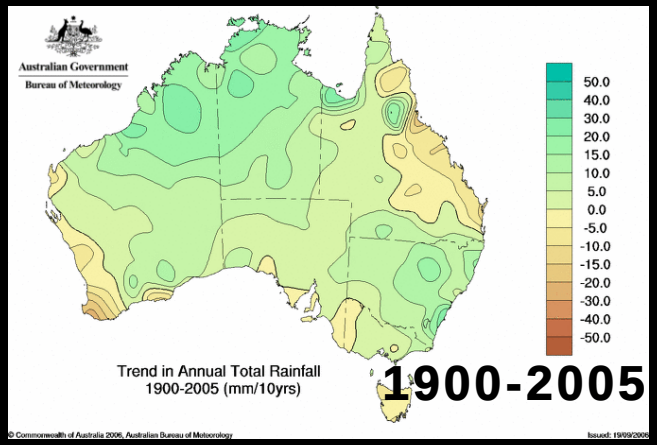
FIGURE 2

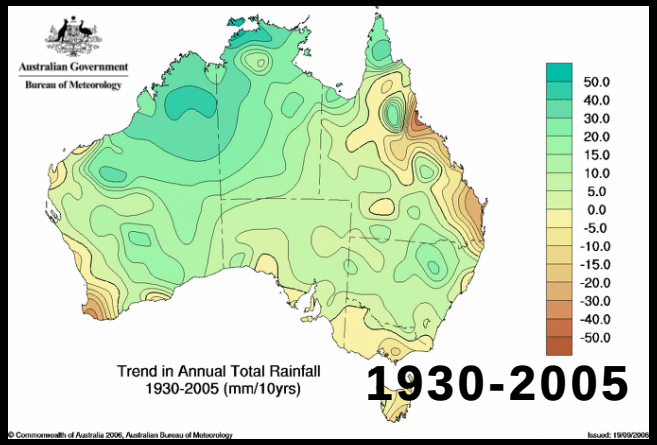
TREND IN ANNUAL TOTAL RAINFALL IN MM/10 YEARS FOR THE PAST 50 AND 100 YEARS. BLUE INDICATES AREAS THAT HAVE BECOME WETTER AND RED/PINK INDICATE AREAS THAT HAVE BECOME DRIER.

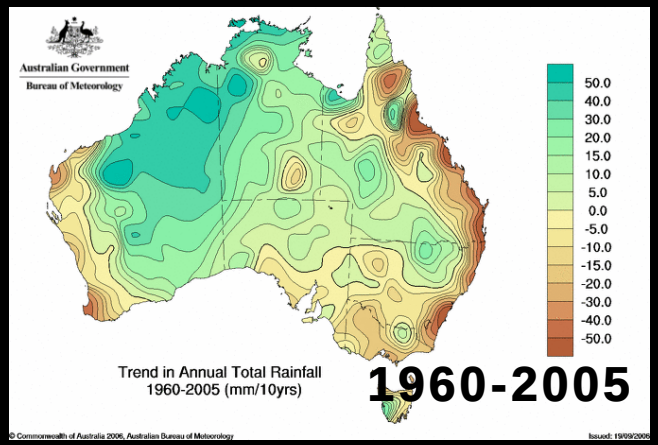
TREND MAPS OF AUSTRALIAN CLIMATE VARIABILITY AND CHANGE. SOURCE: BUREAU OF METEOROLOGY.

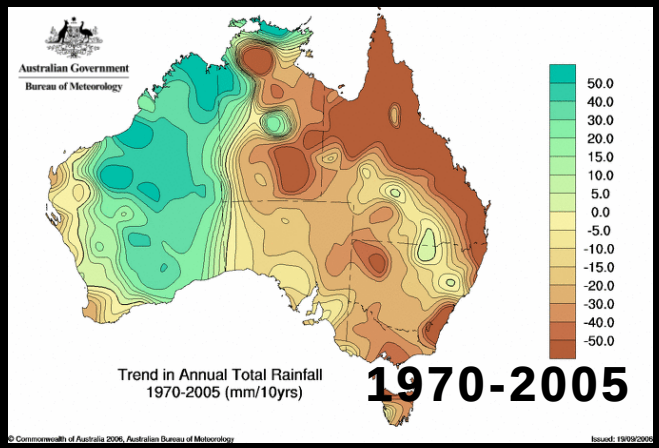


Trend in Annual Total Rainfall - Australia

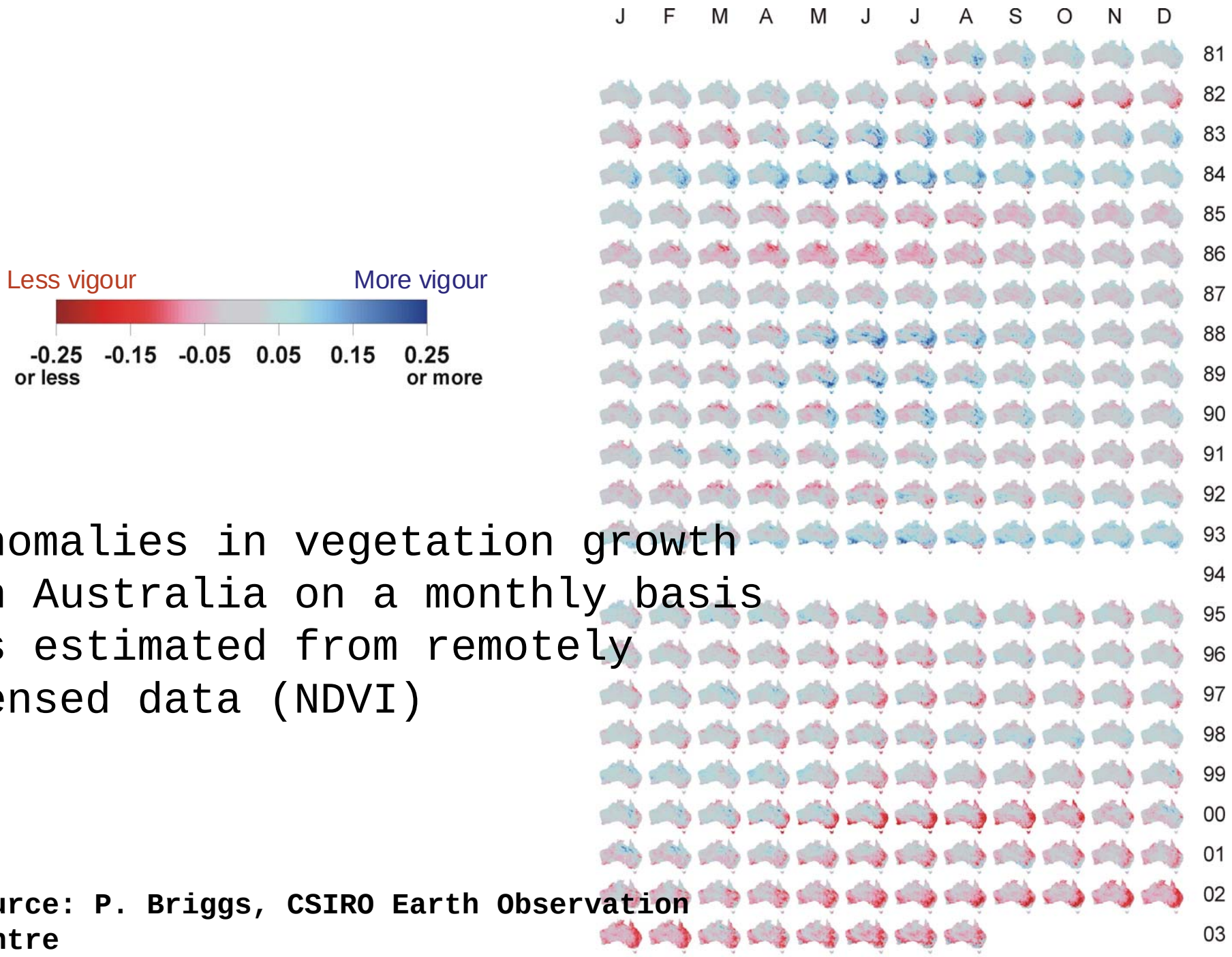








Australian Bureau of Meteorology



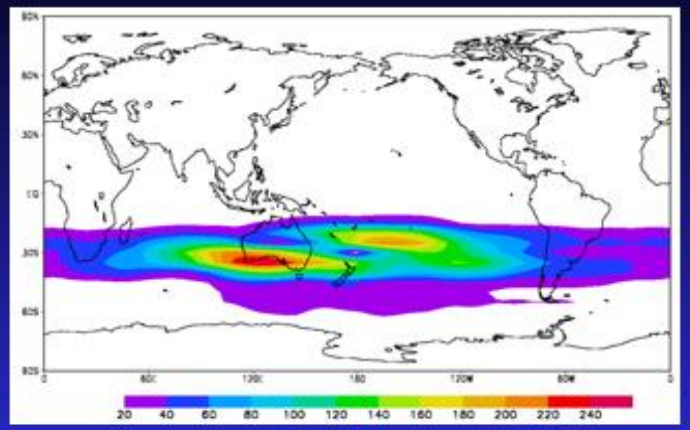
Anomalies in vegetation growth in Australia on a monthly basis as estimated from remotely sensed data (NDVI)

Source: P. Briggs, CSIRO Earth Observation Centre

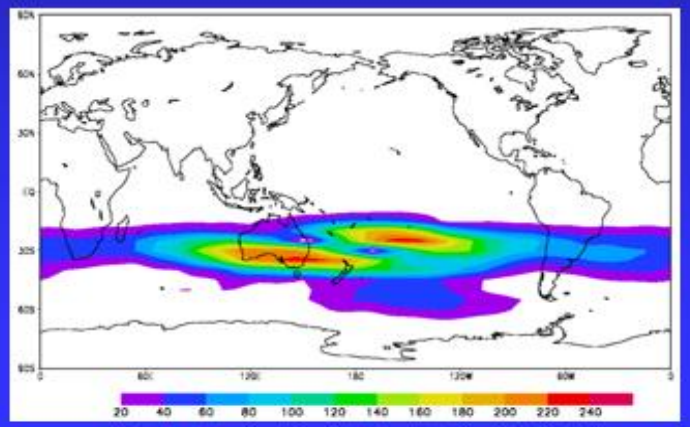
Trend in Annual Total Rainfall - Australia

SH Winter Storm Tracks

1949-68

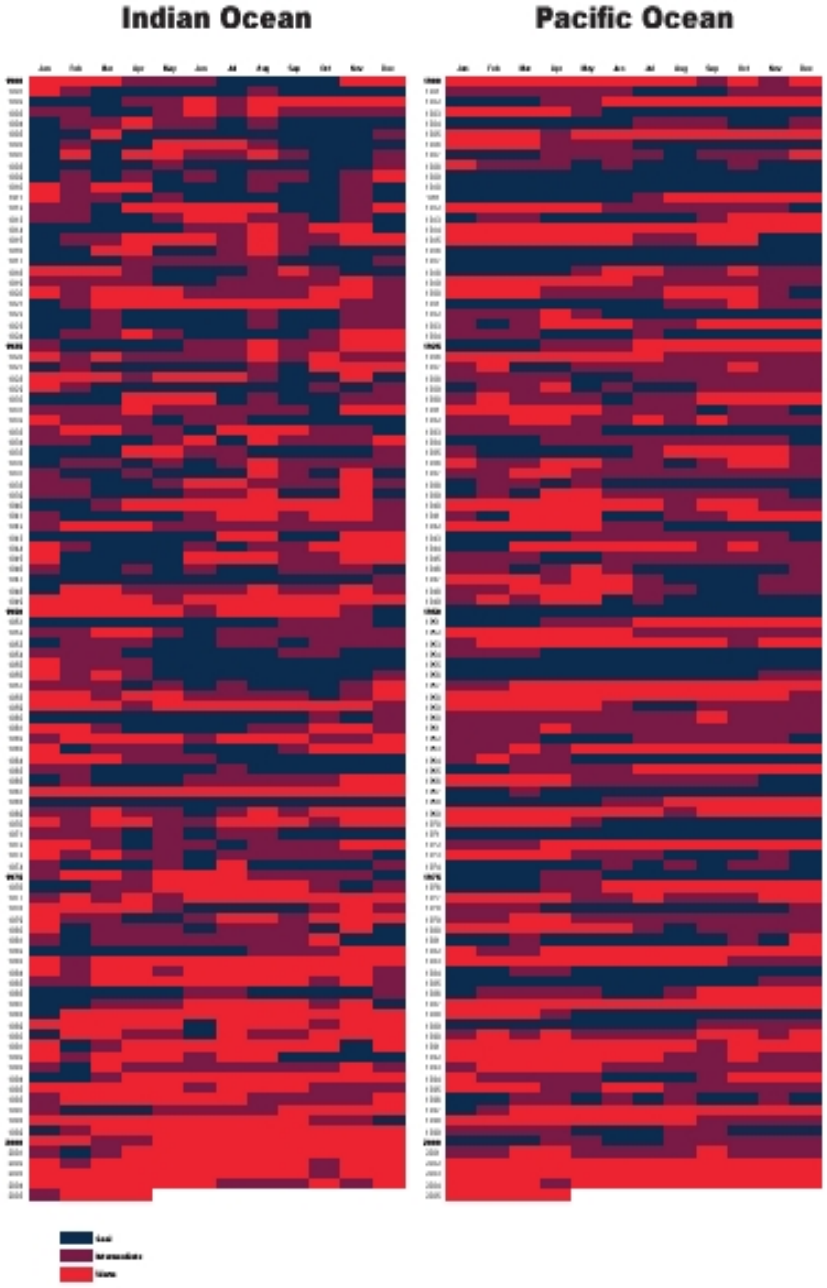


1975-94



Australian Bureau of Meteorology

Sea Surface Temperature
1900 - 2005



The Perfect Ocean for Drought

Hoerling and Kumar, Science 299: 691-694 (2003)

The 1998-2002 droughts spanning the United States, southern Europ
Asia and the mid-latitudes of the southern hemisphere such as SE
were linked through a common oceanic influence. Cold sea surface
(SSTs) in the eastern tropical Pacific and warm SSTs in the weste
and Indian Oceans were remarkably persistent during this period.

….the warmth of the tropical Indian Ocean and the west Pacific Oc
unsurpassed during the 20th century, being embedded within a mult
warming trend. ***Climate attribution studies find that this warmi***
since 1950) is beyond that expected of natural variability and is
ocean's response to increased greenhouse gases.

GLOBAL CHANGE
IGBP

Is the 50-year drying trend in eastern Australia linked to climate change?

The scientific evidence is, at present, not conclusive, but there are some significant pieces of work that suggest a linkage:

Increasing SSTs in the central equatorial Pacific Ocean ("El Nino-like conditions"), linked to decreasing rainfall over eastern Australia (Watkins 2005)

Observed poleward (southward) migration of the mid-latitude westerlies, which drive the rain-bearing fronts from the Southern Ocean (e.g., Cai and Cowan 2007)

Increasing skill of climate models in simulating observed changes in rainfall (and the reasons behind them), and thus increasing confidence in model projections of continuing/intensifying drying (IPCC WG1 SPM-13)

In summary, there is not yet conclusive proof that the drying trend is related to climate change, but there is a significant (and growing) risk that it is.