KEY SYNOPTIC COMPONENTS OF COOL SEASON RAINFALL ACROSS SOUTHERN AUSTRALIA

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Background & Motivation

- Winter grains are grown on the southern Australian inland plains where rainfall is relatively low and highly variable.
- Precipitation ‘events’ are usually associated with identifiable synoptic-scale systems.
- Categorisation of rain-producing synoptic systems enables:
  - Connections to be made between remote climate drivers and regional rainfall (Risbey et al., 2009a & 2009b)
  - Development of diagnostic tools for assessing the performance of climate models in representing the synoptic mix (Pook et al., 2010; Grose et al., in press)
Southern Analysis Regions

April-October rainfall (mm) and synoptic analysis regions

CWB

swwa analysis box

Mallee analysis box

Tas analysis box
Analysis Procedure
(NCEP/NCAR Data – ‘synview’ interface)

**Thickness Anom**

**MSLP/Thick**

**Rain/SST anom/Trajectory**

Analysis Box

Auto Ident system

1000-500 hPa
500 hPa hgt
250 hPa wind
Additional Aids to Analysis

Thickness Anom  Θ X-section  BoM Chart

Frontal recognition  Frontal x-section  GMS Satpic
SYNOPTIC CLASSIFICATION – DOMINANT TYPES

**Frontal**
- Cold fronts
- Complex fronts
- Frontal waves

**Cutoff Lows**

**Warm-cored troughs and lows**

**Airstreams (low-level)**
The Main Synoptic Influences

Cold Fronts & Southern Ocean Depressions

Cutoff Lows and Blocks
Percentage Contribution to Rainfall April to October Growing Season (1956-2009)

(Pook et al., 2006, 2010, 2012)
Gridded Rainfall - Synoptic System Proportions
April to October Growing Season

Cutoff Low Rain

Frontal Rain

[AWAP (V3)]
Monthly Distribution

Monthly percentage of cutoff rain

Monthly percentage of frontal rain

(Pook et al., 2006, 2012)
Growing Season Time Series

Cutoff Lows

Fronts

(Pook et al., 2006, 2012)
April to October MSLP & 500 hPa (NCEP)

MSLP

500 hPa
Summary

- It is important to identify which synoptic systems make the main contributions to rainfall in each region for the following reasons:
  - The proportional contributions reflect the underlying broad-scale influence of the long-wave pattern
  - The dominant synoptic systems shift from Southern Ocean fronts in the SW to cutoff lows in the SE
  - Cutoff rainfall is more highly variable than frontal rain and generally accounts for the heaviest falls
  - The proportion of cutoff rainfall is highest in autumn and spring while frontal rain becomes more important in mid-winter
  - Cutoff rain has decreased more in the past 40 years than frontal rain (decline in rain per cutoff low system)
  - In general, coupled climate models do not simulate cutoff lows and blocking very well


Pook M. J., J. S. Risbey and P. C. McIntosh: A comparative synoptic climatology of daily rainfall in major grain-growing regions of southern Australia (in prep.).


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