

What makes it rain?

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A major interest in agriculture is rain.

You may have noticed that most significant rainfall events in New South Wales involve air that has been brought in over the State from at least one of six major influences:

- monsoons and cyclones in the tropical regions
- north-west cloud bands from the northern Indian Ocean
- 30–50 day oscillation cloud bands
- cold fronts pushing up from the Antarctic
- trade winds coming across the Pacific onto north-eastern Australia
- on the east coastal strip, high pressure systems in the Tasman sea bringing moist easterlies onto the coast.

Evaporation from the warmer ocean waters provides a ready source of moisture. Cooler air originating from the Southern Ocean will have less moisture available for precipitation, although good falls can occasionally occur from these systems.

Unfortunately, having a good source of moisture is not sufficient for rain to develop. A mechanism to force the air to cool and cause precipitation is also necessary. This might be a front, a low pressure system, a cut-off cold pool, orographic lifting, heat convection, mechanical turbulence or a mixing of cool and warm air in the trough between two highs.

So, you need to watch for intrusions of moist air (which hopefully will show up as cloud, though not always) and potential interaction with some mechanism that will encourage it to precipitate. The following two examples show intrusion and precipitation mechanism very readily.

North-West Cloud Band

Most North-West Cloud Bands occur from mid autumn to early spring. They sometimes bring extensive rain to inland, southern and eastern

Australia. They average approximately two per month, with typical duration from one to four days.

The band forms to the east of a large trough off the coast of Western Australia as warm, moist subtropical air moves south-west and ascends. This broad-scale ascent is a mechanism that may, in itself, produce widespread rainfall.

Interaction with other features may also occur, such as an undercutting front which will enhance precipitation. Insulation is increased as the cloud band thickens, resulting in lower maximum temperatures.

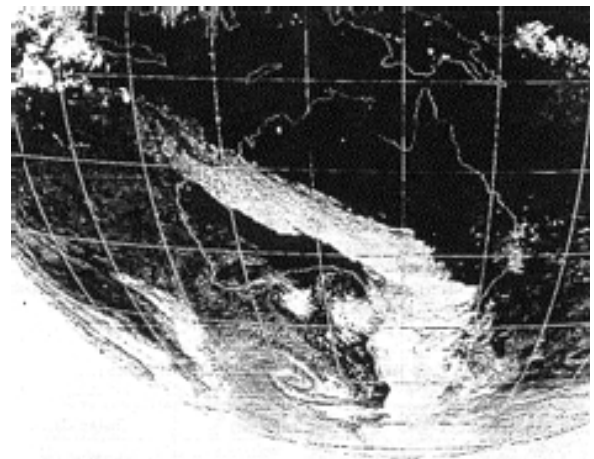


Figure 1. A classic North-West Cloud Band

Monsoons and cyclones

In summertime, cyclones or depressions (called 'tropical cyclones' if they are intense enough) can move down the Queensland coast, dragging air southward from the Coral Sea and producing rain in southern Queensland and northern NSW.

Alternatively, as this picture shows, cyclones may form over the west coast where they degrade into tropical rain depressions. These leave a huge amount of moisture in the atmosphere where the general southward and eastward drift will bring it over NSW. Once here it can interact with local pressure systems to produce storms or rain.



What are the mechanisms to trigger rainfall?

For rain to fall, moist air needs to cool, resulting in condensation of vapour. This is commonly achieved by something which forces the air to rise.

Air rises because of:

- hills and mountains (orographic lift)
- irregularities on the earth surface, causing mechanical or frictional turbulence
- air pressure systems colliding, such as cold fronts undercutting warmer air
- hot air uplift (convection).
- low pressure systems, in which there is a general area of upward movement

If there is sufficient moisture and the air rises enough to form dense clouds there could be rain from any of these.

The diagram below shows one of the major triggers for winter and spring time rain, a classic cold front undercutting and lifting warmer moist air to form rain. This is a common occurrence in southern Australia but less frequent in central NSW or further north.

Acknowledgements

Cloud pictures courtesy of Bureau of Meteorology from data by the Japanese Meteorological Agency
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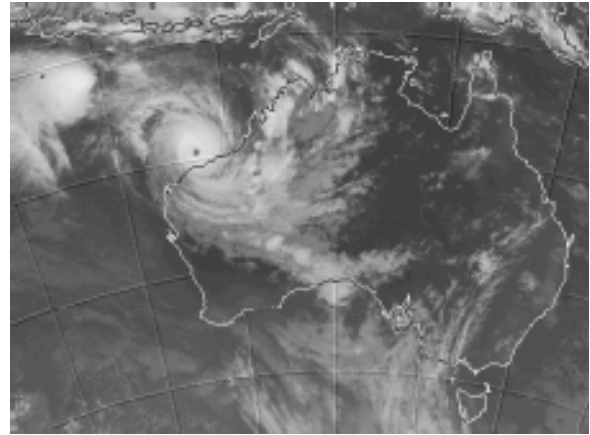


Figure 3. This intense cyclone crossed the Western Australian coast in mid-December 1999

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (May 2007). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

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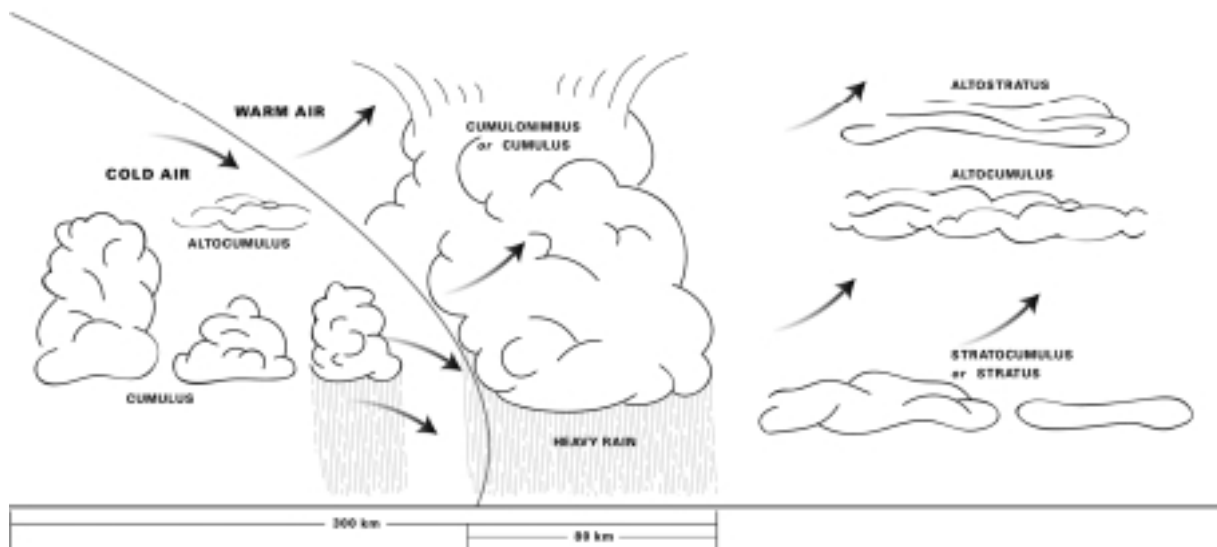


Figure 2. The Norwegian Frontal Model