

SEVERE HAIL STORM - BRISBANE, QUEENSLAND

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Abstract: The following report describes a violent thunder and hail storm which occurred over the Brisbane City area in the late afternoon of the 27th September 1955. Description of the actual hail storm is from observations at the Brisbane Weather Bureau but the synoptic and aerological sounding conditions over southeast Queensland are presented as explanation of the storm development.

The hail was unusual from three aspects, namely the size and peculiar formation of conglomerates and the prolonged period during which precipitation was only in the form of massive falling stones. The synoptic situation was typical of spring thunder-storm weather but the aerological sounding at the regional radiosonde station was striking in its depth of about 30,000 feet of instability and 20,000 feet of sub-freezing temperatures in the instability layer. It is considered that this instability with the appropriate low level warmth and moisture was sufficient in itself to promote a severe thunder and hail storm but a diffuse cold front evidently passed over the area and could have contributed to the intensity of the storm. The existence of a sharp upper trough would also have contributed to uplift.

1. INTRODUCTION

In the late afternoon of the 27th September, 1955, a hail storm of unusual severity occurred over the Brisbane City area. The storm was phenomenal from three aspects:-

1. Length of period during which hail fell.
2. Absence of actual rain drops for a considerable period during the falling hail.
3. Size, shape and formation of the hail stones.

2. DISCUSSION

1. Synoptic situation and aerological sounding: The surface synoptic situation at 3 p.m. on the 27th is shown on figure 1 indicating a main centre of low pressure well inland and a minor centre to the east over the Darling Downs preceded on the south coast of Queensland by strong moist northeast winds.

The two centres of low pressure were apparently along a frontal boundary which extended east-southeast to the north coast of New South Wales while a second (cold) front was further to the southwest.

Upper wind conditions shown in figures 3, 4 and 5 indicate a frontal boundary in low levels, somewhat diffused in middle levels with strong cold westerlies but between 25,000 and 30,000 feet there was a sharp trough. Figure 2 shows the synoptic chart for 0900 hours on the 28th September - a more or less weak field of pressure but suggesting relative high pressure cells to the north of Brisbane and over northeast New South Wales. Supporting information for the northern cell from the limited night network are the following facts:

southwest gust of 62 m.p.h. at Brisbane at 1855 hours with southwest wind holding up to 2000 hours and then setting in again at 0300 hours; at 2100 hours Lismore to the south and Double Island Point to the north both reported a southwest wind, while Bundaberg reported a southwest wind at 0300 hours.

The early afternoon aerological flight from Amberley (fig. 7) shows a very unstable state reaching to 33000' and is in itself sufficient argument for a hailstorm of some magnitude. This sounding was made at Amberley some 20 miles inland from Brisbane. The temperature and dew point 21°C and 16.5°C respectively for Brisbane at 1500 hours are plotted on the chart and it is reasonable to carry the Brisbane conditions along the dotted line to 850 millibars which accentuates the instability over Brisbane.

Convective cloud building was possible to at least 33,000 feet with temperatures of freezing level at 10,000 feet to -23°C at 20,000 feet and -46°C at 33,000 feet. There was accordingly in the instability column some 20,000 feet of sub-freezing temperatures with a lapse rate above normal. Extrapolated mean temperatures for the end of September in the Brisbane area and the actual temperatures on the 27th are given in Table I.

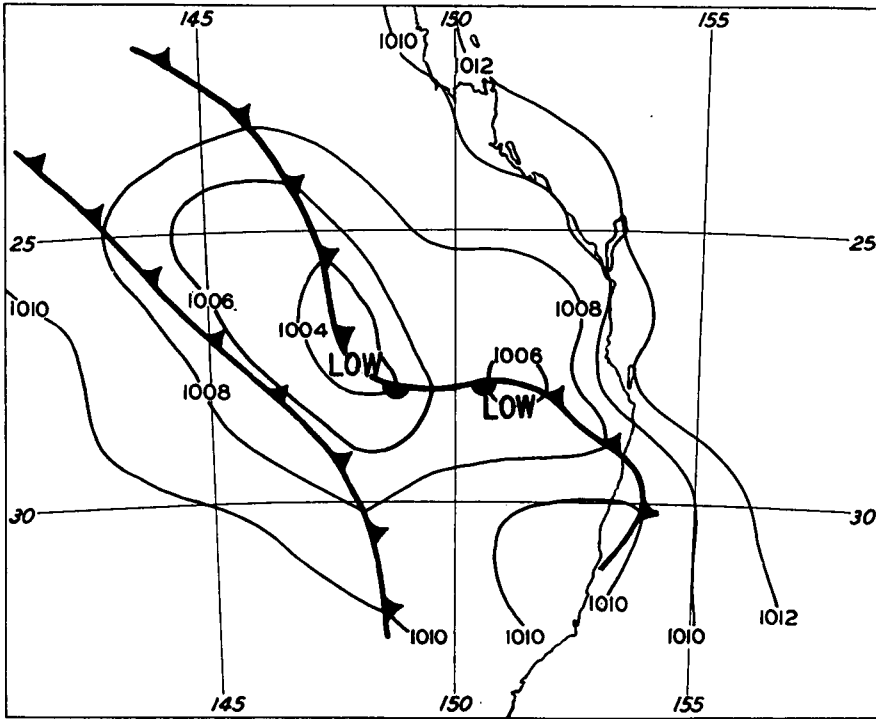


FIG. 1. M.S.L. CHART. 1500.K. 27-9-55.

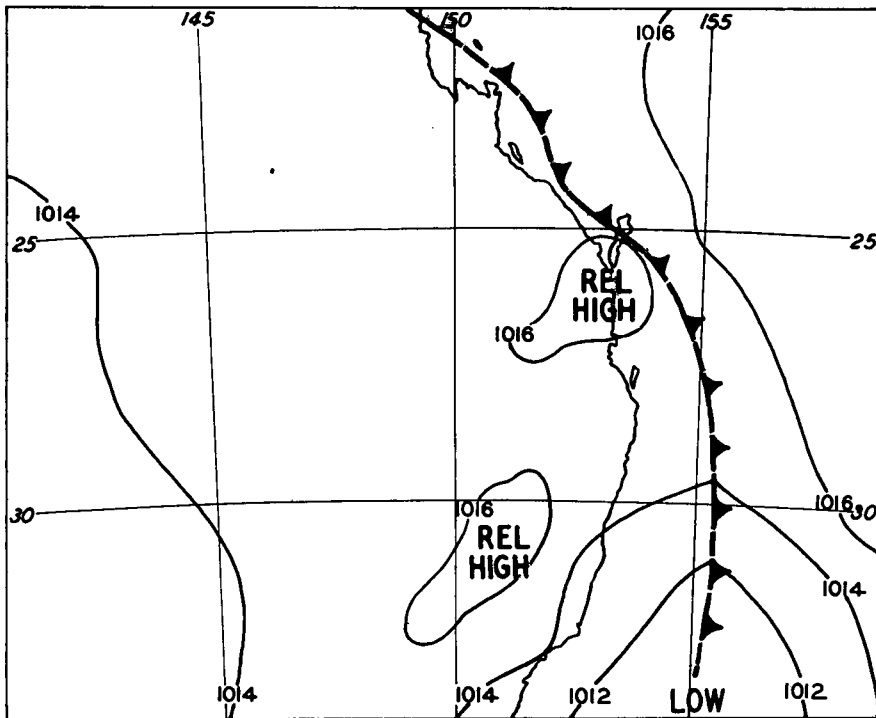
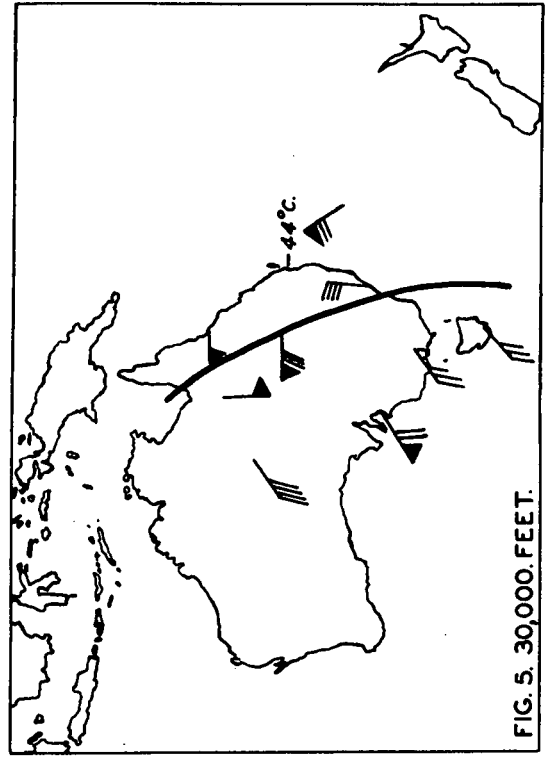
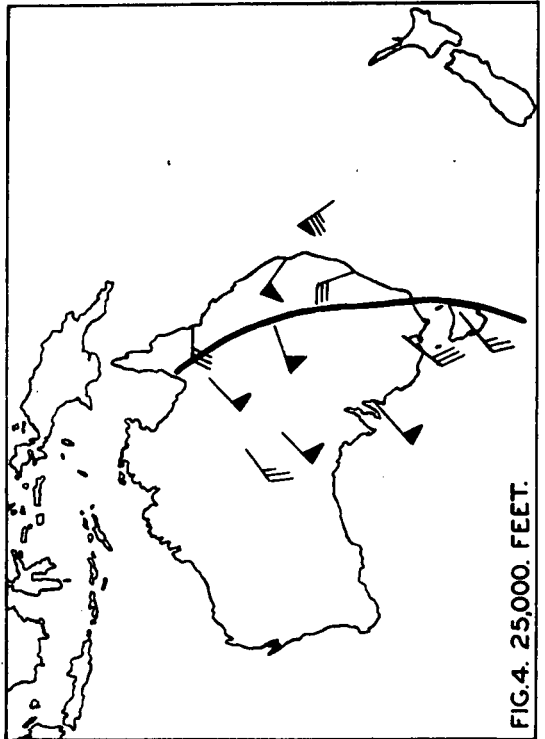
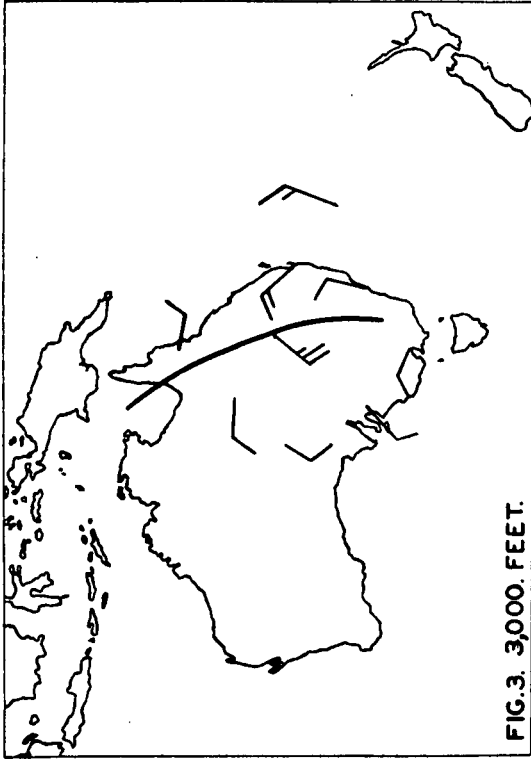


FIG. 2. M.S.L. CHART. 0900.K. 28-9-55

UPPER WINDS.

1400. HOURS. 27-9-55



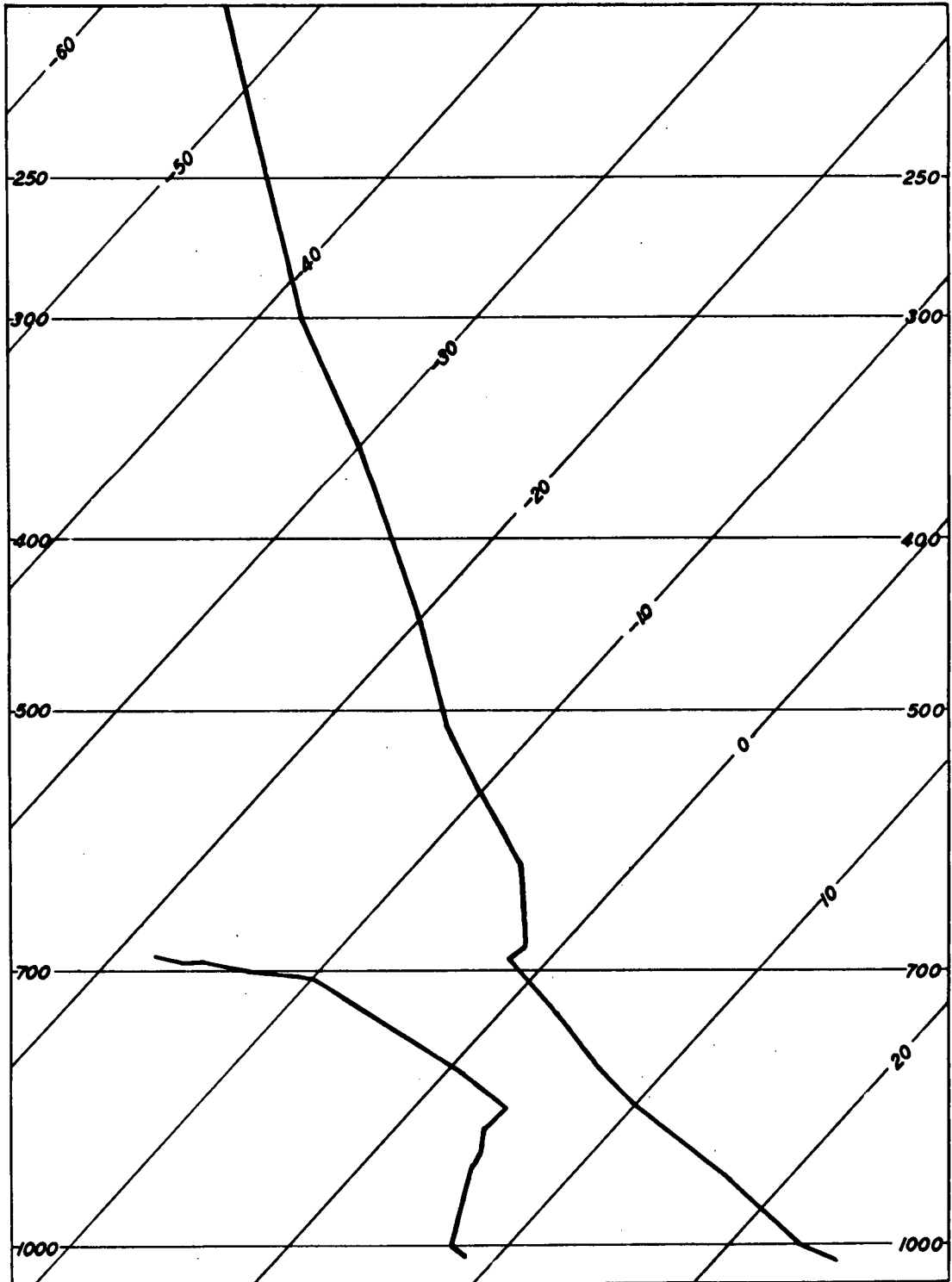


FIG. 6. AEROLOGICAL SOUNDING AMBERLEY 0400.Z. 26-9-55.

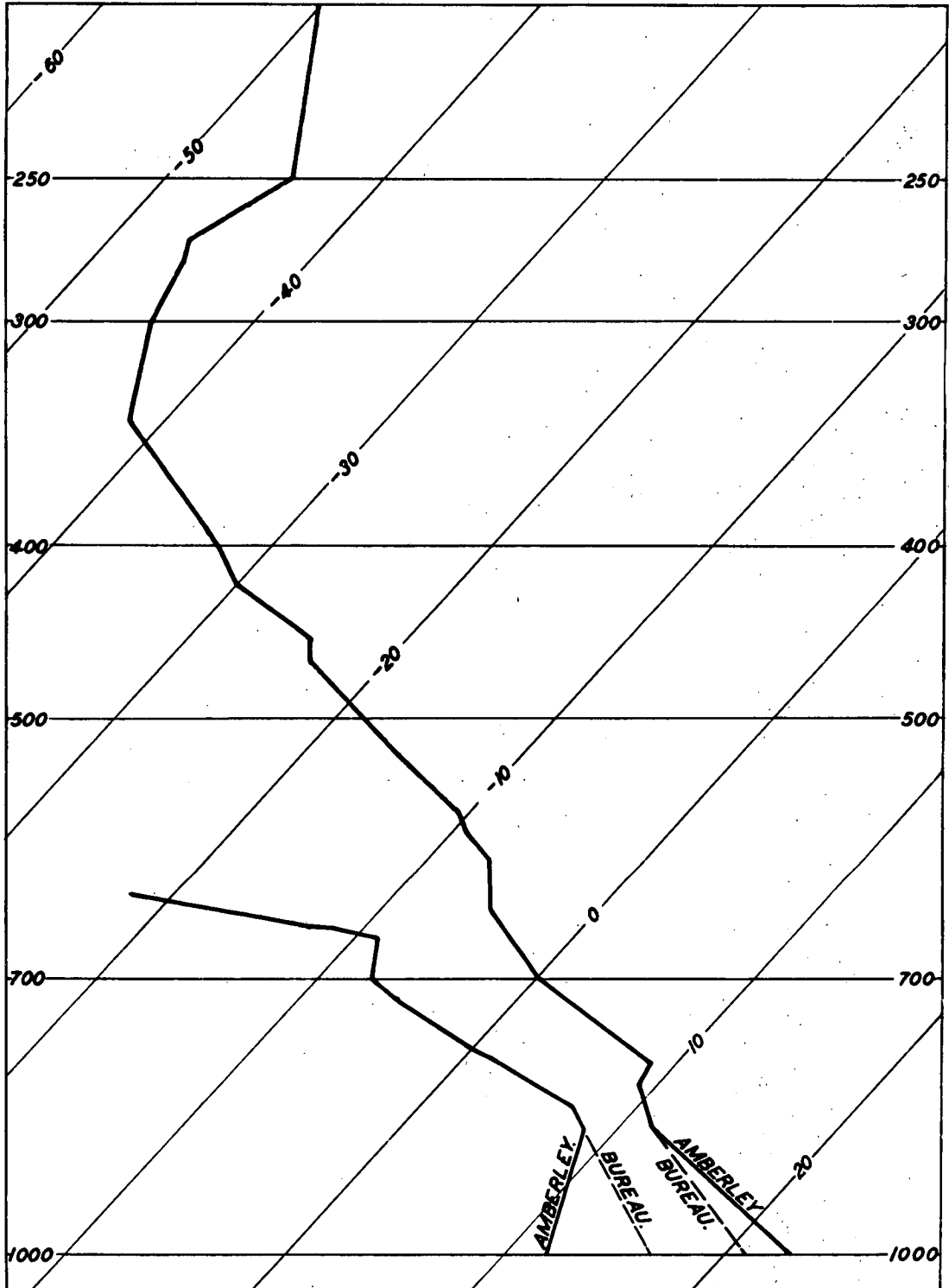


FIG. 7. AEROLOGICAL SOUNDING AMBERLEY. 0400.Z. 27-9-55.

TABLE I

Mean upper air temperatures Brisbane region and actual temperatures on 27.9.55. Means extrapolated from CMB Bulletin No.42.

Height	Mean	Actual	Diff.
850 mbs	10°C	11.5°C	+1.5°C
700 mbs	1.5	0	-1.5
500 mbs	-14.5	-19	-4.5
400 mbs	-25	-32.5	-7.5
350 mbs	-32	-40	-8.0
300 mbs	-40	-45	-5.0
850-350	42°C	51.5°C	9.5°C

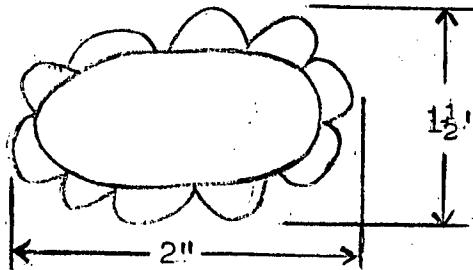
For historic purposes figure 6 shows the Amberley aerological sounding for the previous day (26th) and the marked increase in instability is clearly seen.

2. Sequence and Description of the Storm and Hail at Brisbane

- 1500 hours Temperature 21°C, Dew Point 17°C. Wind north-east 10 knots. Thunderstorms noted in the south-west quadrant from the city.
- 1635 hours Thunderstorms commenced with rain at Brisbane.
- 1655 hours Hail commenced varying in size from sago to large peas.
- 1710 hours Hail was increasing in size.
- 1715-1725 hours Hail reached maximum size but comprised, in most cases, conglomerates and during this period all precipitation was in the form of large hail.

The larger stones were in three main categories:-

- (1) comparatively solid stones, a few the size of a golf ball.
- (2) roundish conglomerates of smaller stones not unlike a cluster of quartz crystals.
- (3) flattish conglomerates. Most of these stones had a concentric flat layer in the centre with accretions of smaller stones adhering to the outside - the outer accretions were a clearer white giving either the impression of a fried egg or a centre with scalloped edging, as shown in the following sketch.



Many of the conglomerates shattered as they struck the concrete paths. Unfortunately owing to the time of the day and unavailability of a suitable camera, good photographs could not be obtained. The first thunderstorm and hail finished at approximately 1800 hours when the temperature was 20°C, dew point 18°C and wind northnortheast. A second thunderstorm occurred at 1855 p.m. accompanied by a wind gust of 62 m.p.h. from the southwest. At 2100 hours the wind had turned again to northnortheast but with temperature 13°C and dew point 12°C, suggesting a definite change in air mass at the surface. Considering the intensity of the hailstorm there was a remarkable absence of damage in the city area although the roofs of one or two cars were pierced and some houses in the suburban areas were unroofed by the subsequent squall.

3. SUMMARY

Normal conditions for thunderstorm development were indicated by:-

- (1) an extensive area of low pressure with minor centres.
- (2) comparatively warm and humid conditions in low levels.
- (3) strong upper west to southwest winds which in September are potentially cool.

The aerological sounding contributed to factual data in:-

- (1) confirming a suitable unstable lapse rate
- (2) showing a considerable depth of sub-freezing temperatures.

These two facts would indicate violent turbulence and freezing with the consequent hail formation.

The above facts could be considered sufficient to promote a storm of such intensity without any attendant cold front activity. It is nevertheless possible that there was a cold frontal movement through the region which could have contributed to the intensity of the thunder and hailstorm. The upper trough would also have been an assisting factor in promoting uplift.

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