

THE THUNDERSTORMS IN THE SOUTH ISLAND ON 14th

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During the morning of January 14th several thunderstorms were reported at synoptic stations in the South Island, notably at Wigram Aerodrome. Thunderstorms at Wigram are fairly rare and usually occur only at cold fronts and in the cold air behind them. This one, however, occurred with a NW wind, which is all the more unusual in that precipitation of any kind is very rarely experienced with northwesterers, which of course are Fohn winds. Warm front rain is rarely met with because of the effect of mountain ranges across the paths of warm fronts described on page 299 of Petterssen's "Weather Analysis and Forecasting."

Analysis of the synoptic charts for the day in question showed a well-occluded depression passing to the south with warm and cold fronts crossing New Zealand. The barogram at Jackson's Bay indicated that the warm front passed at 7 a.m. but no definite conclusions could be drawn from that at Puysegur Point. The Tairaroa Head barogram showed the passage of the warm front at about 10 a.m., while it passed Wigram at 11 a.m., being accompanied by a thunderstorm of a few minutes duration, a change in wind direction and speed to NW 15 m.p.h. and a sharp increase in temperature after the initial fall due to the cold rain from the thunderstorm. The relative humidity also rose and remained between 55% and 70% for about two hours, after which it fell rapidly to about 35% due to the Fohn effect. The Wigram dew point at noon was 8 degrees higher than at 9 a.m.

A comparison of the isochrones for the thunderstorms reports at climatological and rainfall stations with the positions of the warm front at 9 a.m. and noon indicate that the thunderstorms actually accompanied the warm front.

The air in advance of the warm front was very stable, widespread fog and drizzle being reported on the west coast of the South Island at 6 a.m. At 9 a.m. several thunderstorms and showers of rain were reported in Westland and Southland and at noon this area of thunderstorms had extended eastwards to beyond Christchurch.

A temperature flight was made in the warm air at Nelson at 9 a.m. on the 14th and this, when plotted on a Rossby diagram, showed that the air was of tropical origin. The tephigram for the flight showed that the air was conditionally unstable, the instability being of the pseudo-latent type as the air was comparatively dry. The air was also convectively unstable. If the relative humidity near the ground at Nelson had been as high as elsewhere in the same air mass, a considerable amount of energy would have been available to be released on lifting the air through a few thousand feet.

The cumulonimbus cloud could only have been formed in air which had been subjected to lifting, either along mountain ranges or at fronts; hence east of the ranges thunderstorms could only have been found at the warm front itself. At 9 a.m., for example, Jackson's Bay reported a thunderstorm, Greymouth showers of rain, while at Hokitika and Westport there was drizzle; Wellington reported fog and drizzle. At three places a few miles from Hokitika thunderstorms were also reported during the morning. Fog and drizzle therefore, were common in areas where lifting of the air mass at the time was insufficient to release the energy necessary for the formation of cumulonimbus clouds, showers and thunderstorms. It is perhaps worthy of note in this connection that apart from some afternoon thunderstorms in Southland and Otago which were obviously associated with the cold front, all the thunderstorms occurred during the morning, that is, during the actual passage of the warm front across the South Island. At Wigram the thunderstorm lasted for only a few minutes, after which the cumulonimbus cloud passed away to the east.

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A further note on this subject, dated 2nd April, 1942, has been received in the Meteorological Office, Wellington:-

The following are some particulars of the warm front which passed Wigram this morning. It was apparently similar in many respects to that of the 14th January, in that the warm air was unstable. On that occasion, thunderstorms and showers were experienced only at the warm front itself, whereas this time several showers passed over later in the morning after the warm front had passed.

The reports of rain at Fairlie and Ashburton at 6 a.m. made me suspect a warm front, but I confess I was fairly doubtful about it. However, the report of a thunderstorm at Fairlie later in the morning and the high dew point at Puysegur Point in common with the rest of the west coast stations more or less confirmed my idea.

At 0600 hours the cloud was 9/10 As. and Ac. with a NW arch and breaks to the east. By 0800 hours the sky had become completely overcast. The wind which had been light NE on the surface, changed abruptly to SW 10 m.p.h. at 0850 hours, remaining from that quarter until 0925 hours when it became calm for a few minutes and then NE 5-10 m.p.h. The upper winds were more northerly and rather stronger at 1100 hours than at 0600 hours. During both flights they were northerlies backing gradually to westerlies with height.

Rain commenced at 0900 hours and ceased at 0950 hours. The actual rain-drops were very large, similar to those usually encountered from heavy Cum. The actual fall was about 13 points.

At 0930 hours large breaks in the cloud sheet appeared to the west and the western edge of the cloud sheet which could then be seen to be Cum. passed overhead at about 0950 hours. Afterwards, several banks of Cum. and Ac. remained over the Plains but mainly to the north. To the south the sky appeared to be clear.

The pressure which had been rising slowly, commenced to rise rapidly, increasing 1.6 mb. from 0850 hours to about 0920 hours, when it fell an equal amount between that time and 0945 hours. Then after a further slight rise, the pressure remained steady for about two hours after which it started to fall.

The temperature remained fairly steady for the two or three hours prior to about 1015 hours when it commenced to rise steadily.

The dew point at 1000 hours and 1100 hours was 62°F, i.e. 4°F higher than at 0830 hours.

14th April, 1942.