

GMS VISIBLE SATELLITE PICTURE — 3 p.m. 10 AUGUST 1994

Erick Brenstrum

Meteorological Service of New Zealand Ltd

This picture is a good example of sheltering effects in a southwest airstream. Cumulus clouds covering the seas east and west of New Zealand are bringing showers to places like Invercargill and Auckland, that are exposed to the southwest. By contrast, much of the country is experiencing fine weather, including Dunedin, Christchurch, and Wellington, because it is in the lee of the hills between Otago and Southland.

A ridge of high pressure is approaching New Zealand from the southwest. Consequently the cloud tops are limited by a subsidence inversion caused by air descending, and therefore warming, after passing through the ridge. At 00 UTC (midday, local time), the inversion had descended to an altitude of about 1.5 km above Invercargill, 3 km above Paraparaumu, and 3.5 km above Kaitaia. So, in the picture, the cumulus cloud tops are higher to the north and east.

The increasing stability has caused wave cloud to develop in the lee of Banks Peninsula. Wave cloud also covered most of Otago two hours before this time.

Snow can be seen on much of the South Island high country as well as Mounts Taranaki and Ruapehu.

A rope cloud extends eastward from East Cape. It is followed by a southerly change, and a temperature decrease of 3 C. It marks the boundary between air that has crossed the Waikato and the Bay of Plenty and air that has travelled up over the seas immediately east of New Zealand. The rope cloud is caused by the difference in density between the air warmed slightly in passage over land and the cooler air that has only been over the sea.

The warmer air is lifted and destabilised by the cooler air resulting in a line of cumulus. In favourable circumstances rope clouds can develop into squall lines with cumulonimbus clouds and thunderstorms. However in this case, the warmer air is relatively dry because it has lost much of the moisture it had in showers triggered by crossing the hills of the central North Island. Consequently, the rope cloud cumulus has limited vertical extent.

Correctly forecasting which areas of New Zealand have showers and which have fine weather in southwest situations depends on precisely forecasting the wind direction.

If the wind direction was about 20 degrees more southerly than is the case in this photo, then showers would be affecting most eastern areas from Otago to Gisborne, including Wellington. If instead the wind direction was 20 degrees further round to the west, then showers would be affecting Taranaki, Buller, and Westland.

Furthermore, in Spring, the solar heating of the land in the cloud free areas can lead to significant cumulus development by afternoon, particularly when combined with cooling aloft because of a poleward jet exit in the high-level southwest flow. In November this combination of events sometimes leads to cumulonimbus clouds developing over the Canterbury plains with hail the size of golf balls.

