CORRESPONDENCE

EARLY MOUNTAIN OBSERVATIONS IN AUSTRALIA

F. Loewe

Almost to the start of this century the only way of obtaining information from the free atmosphere was by measurements from free-floating balloons, although kites had sometimes been used since the middle of the 18th century (Kopp, 1935; Khrgian, 1959). In this way only occasional observations could be secured. For this reason measurements at high points of the ground were of great interest (Erk, 1899) and meteorological stations were established on mountain tops and in passes. The oldest observatory on a summit, Hohenpeissenberg in Upper Bavaria (47°49'N, 11°0'E, 989 m) was started in 1781 and has been in uninterrupted operation ever since. Early mountain stations existed on the Gotthard Pass of Switzerland since 1781 at a height of 2115 m and on the Grand St Bernard (45°52'N, 7°10'E, 2479 m) on the border between Switzerland and Italy since 1818. Regular observations were started on Pic du Midi de Bigorre in the Pyrenees (42°57'N, 0°8'E, 2859 m) in 1880, on Säntis, Switzerland (47°15'N, 9°20'E, 2500 m) in 1882, on Sonnblick, Austria (47°3'N, 12°57'E, 3105 m) in 1887, and on Pike's Peak, Colorado (38°50'N, 105°2'W, 4308 m) in 1873. Ben Nevis in Scotland (56°50'N, 5°10'W, 1343 m) where observations started in 1881, has been permanently occupied since 1884.

In Australia it was felt necessary to establish high-level stations during its early days. The first stations were usually in pass and high-valley locations. Mt St Bernard (37°0'S, 147°6'E, 1540 m) was in operation by at least 1882 (Stirling, 1885), and Kiandra (35°53'S, 148°30'E, 1420 m), as suggested in 1879 (Todd, 1894), since 1903.

Mr Clement Lindley Wragge†, who was born in mid-September 1852, was orphaned early. He was trained in law, and had widespread interests in science, including navigation and physical anthropology. He went to sea and travelled all over the globe (Wragge, 1902b; Jones, 1953). He had been connected with the early observations on Ben Nevis and in 1881 ascended the mountain five times a week from sea level at Fort William to take observations at the summit at 9 am and 10 am; in view of the frequently very harsh weather conditions "if this be not devotion to meteorology, we should rather like to know to what that term should be applied" (Symon's Met. Mag., 1880, 1881). In 1883 Wragge left Scotland for Australia and became "Government Meteorologist" for Queensland in 1887. In 1895 he was commissioned to submit a plan for the organisation of the meteorological service of the colony of Tasmania. In May 1895 he put instruments of a second order station, and later a shelter hut, on top of Mt Wellington (1270 m) near Hobart and at The Springs half-way up the mountain (42°54'S, 147°14'E, 735 m) (Kingsmill, 1895; Wragge, 1896). Rainfall observations at The Springs had been started in 1892. Stations on Mt Wellington and at Kiandra had been recommended in 1879 by the heads of the colonial meteorological services (Todd, 1894). The fate of the Mt Wellington observations is somewhat enigmatic, and it is doubtful how long and how regularly the observatory actually operated. A letter of Kingsmill to the Chief Secretary of 23 January 1896 in the State Library of Tasmania implies that by then no observations had been taken. On the other hand Wragge stated in 1898 (Wragge, 1898a, Inwards, 1896) that observations were being taken on Mt Wellington and at the Half-Way House. In any case no observations have survived (H. Bond, personal communication).

† Australian Encyclopaedia (1963) and Jones, I (1953) give a biography of Clement L. Wragge.

Shortly afterwards Wragge, from his somewhat grandiloquently termed "Chief Weather Bureau of Australia" at Brisbane - a title which evidently did not endear him to his colleagues and superiors - in December 1897 started a meteorological station on the top of Mt Kosciusko, at 2233 m, the highest elevation of continental Australia (Wragge, 1898a, 1902, 1902-03; Heyde, 1939). After the tent in which the three observers initially stayed, was blown away, a hut was built on the summit, the remnants of which were still visible for many years. The funds for the station were provided by Mr Barr-Smith of Adelaide, some shipping companies and the Government of New South Wales. A base station corresponding to the station pair Ben Nevis - Fort William, was started at Merimbula on 1 January 1898. Observations were taken every four hours, and at closer intervals during the morning.

The Mt Kosciusko means for 1898 were published (Wragge, 1902a) and some are reproduced in Table 1. The daily mean temperature was below freezing point for slightly more than five months and above $+10^{\circ}C$ from 5 January to the end of February; the lowest temperature, $-11.2^{\circ}C$, occurred in September; the wind speed, about 4.3 m s^{-1}, was relatively low for a summit station. Heyde's (1939) article contains some data on the diurnal variation of the meteorological elements and on the frequencies of wind directions. The station could be maintained during the winter; but at that time, before the spread of skiing, the observers were very isolated. In his different publications (Wragge 1900, 1902a, 1902-03) he gives vivid descriptions of life on the summit of Australia and shows some impressive photographs. Financially the observatory was in a somewhat shaky position from the beginning and had to be closed for this reason in 1903, shortly before the Ben Nevis Observatory, the place of Wragge's first work as a meteorologist, ceased for the same reason. He felt let down by the Government of New South Wales (Wragge, 1902-03) which in its turn blamed him for overspending Unfortunately the observations on Mt Kosciusko for 1899 to 1903 seem to have disappeared. Wragge left Australia for New Zealand shortly after this and died there in 1922. It is believed that the observations were destroyed there by fire in 1928. Enquiries from his surviving relatives and acquaintances of the family made by Dr Peterson of Monash University proved unsuccessful.

It is highly regrettable - and a warning for similar cases - that these early Australian mountain observations gathered with so much devotion and effort, should be lost, mainly due to personal feelings and lack of interest at the time. A new mountain station, Hotham Heights ($36^{\circ}59'S$, $147^{\circ}8'E$, 1860 m) was started as recently as 1926, 30 years after the start of Wragge's stations.

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Table 1 Mt Kosciusko, monthly means 1898

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
p (mb)	780.0	781.4	780.9	780.1	777.4	777.4	774.5	779.5	774.3	773.6	771.8	778.2	777.4
T_m dry (^oC)	11.0	*11.9*	7.7	2.7	-2.6	-3.0	*-4.6*	-3.1	-2.1	1.6	2.3	7.7	2.5
T_m wet (^oC)	7.1	*7.3*	4.8	0.8	-3.2	-3.8	*-5.3*	-4.0	-2.9	-0.2	1.1	3.8	0.4
dew pt (^oC)	*3.1*	2.7	1.1	-1.8	-5.9	-7.4	*-9.6*	-8.5	-6.4	-2.9	-2.1	0.6	-3.1
rel hum (%)	58	*53*	66	73	*78*	70	67	65	71	71	73	56	67
Wind (Beaufort)	3.0	2.7	2.5	2.8	*3.2*	3.0	*3.2*	2.6	*3.2*	2.7	2.9	*1.7*	2.8
Cloud (tenths)	3.2	3.3	*3.1*	4.7	6.0	*7.6*	6.4	5.9	7.5	6.1	7.4	4.2	5.5
precip (cm)	5.1	26.3	3.8	5.1	-	-	-	-	3.6	5.6	11.7	3.3	-

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Department of Meteorology,
University of Melbourne,
Parkville, Victoria. 3052

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