

Appendix A – Rainfall Analysis

The daily rainfall records for each station were checked for completeness through an automated filtering routine, which indicated missing days or periods. Missing data were replaced with data from a nearby station for the same day or period. If no stations were available for the particular period, then data was taken from another part of the record, representative of the same climatic phase as indicated by SOI. A summary of the available rainfall records is provided in Table A1.

Table A1. Summary of available daily rainfall records.

Station Name	Station ID	Approx. Easting	Approx. Northing	Start Date	End Date	Length (years)	Days Missing	Complete (%)
Kaitaia*	A53121	2534400	6676600	01/10/1893	30/09/1999	106	1595	95.88
Waiharara	A43921	2528700	6694800	01/06/1956	08/05/1994	37.9	244	98.24
Aupouri Forest*	NRC 530204	2528800	6687800	10/03/1967	31/08/1999	32.5	1020	91.40
Kaitaia – Wiessing*	NRC 530205	2534500	6676500	02/12/1992	31/08/1990	6.9	1	99.96

* Still in operation.

Monthly sums were calculated for each rainfall record and results and summary statistics are presented in Tables A2 to A5. From this data moving annual rainfall totals for each station were calculated. Histograms of the monthly and moving annual rainfall data are provided in Figures A1a to A1d.

Mean annual rainfall for each station was subtracted from the moving annual rainfall totals calculated above to determine the residual rainfall mass. Residual rainfall mass plotted on a graph provides a rapid method of visualising above and below average annual rainfall periods, as shown in Figures A2a to A2d.

Significant or prolonged dry periods occurred during 1896, 1898, 1905 to 1906, 1918 to 1919, 1930 to 1933, 1950, 1963 to 1964, 1967, 1973 to 1974, 1982 to 1983, 1987, 1990 to 1991, and 1993 to 1994. Significant or prolonged wet periods occurred during 1895, 1923 to 1924, 1927, 1934 to 1935, 1936 to 1937, 1939, 1946, 1955 to 1956, 1971, 1979 to 1980, 1985, 1988 to 1989, 1995 to 1996, 1998 to 1999.

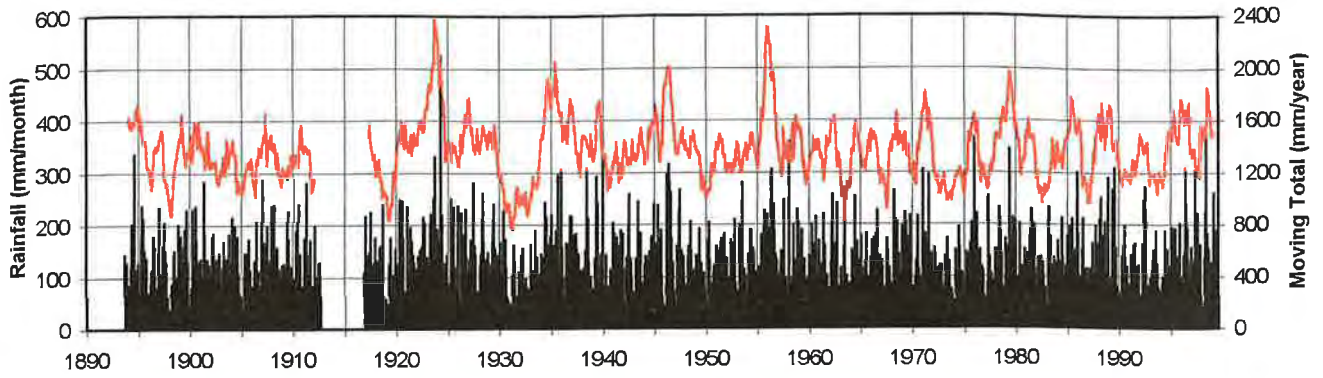
From this data it appears that the frequency of dryer than normal periods is greater from about 1960 to the current time. In addition, the duration and magnitude of wetter than average periods is reduced. This may suggest a long-term climatic variation, but whether this fluctuation is normal is difficult to determine without significantly longer historical rainfall records.

An analysis of rainfall correlation was performed to determine the relationship between stations and whether data from station could be implemented at another station on days of missing data. To remove some of the high frequency nature of daily rainfalls, 30-day moving averages were calculated. Regression charts comparing rainfall at the various stations are shown in Figures A3a to A3f. In general, there is a high degree of correlation between stations as regression R^2 values are all between 75% and 89%.

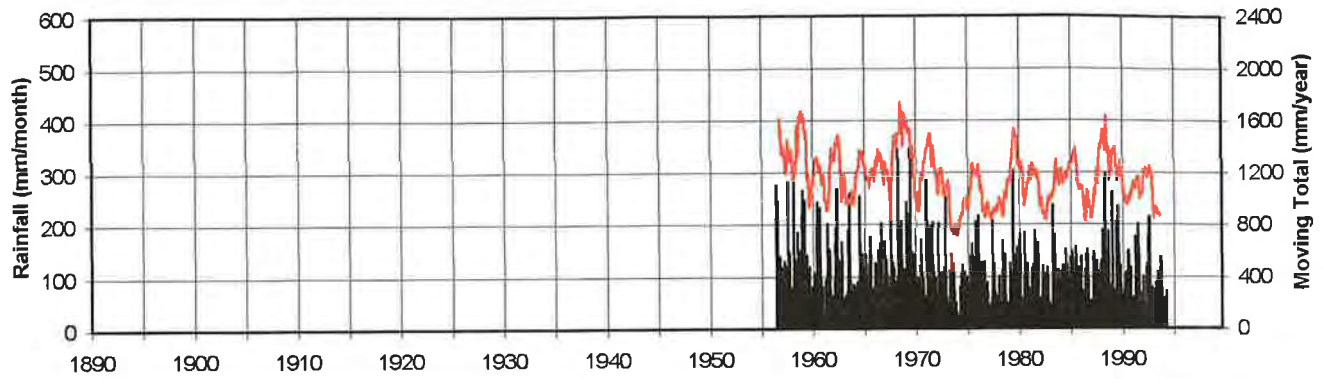


Monthly Sum and Yearly Moving-Total Rainfall

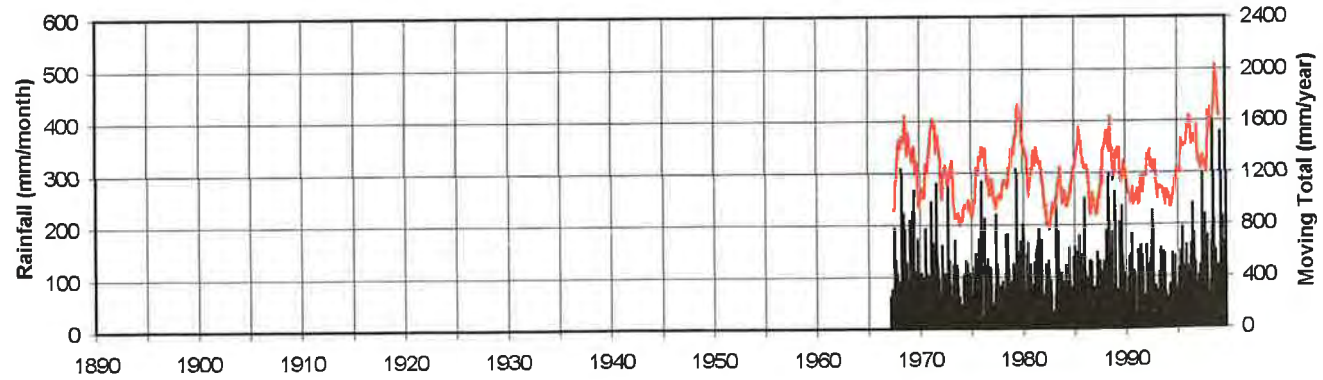
Kaitaia A53121



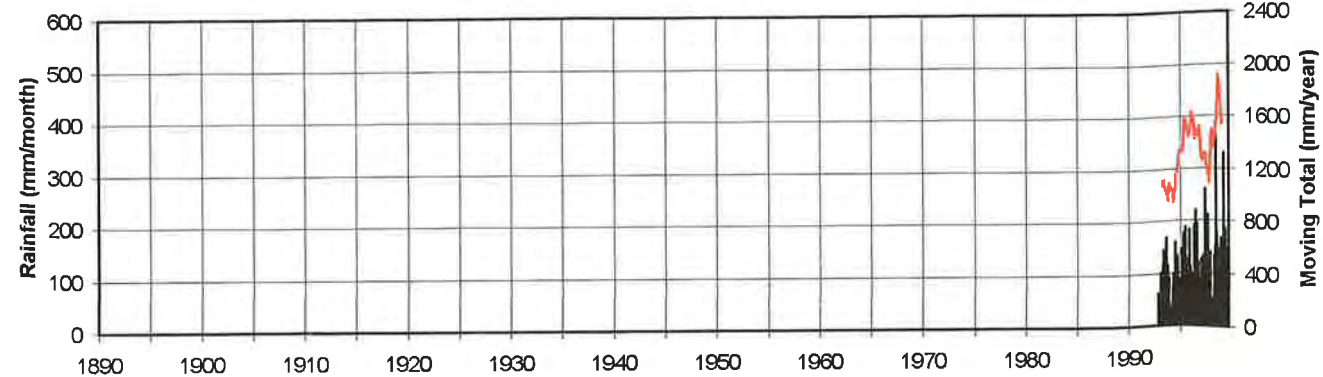
Waiharara A43921



Aupouri Forest 530204

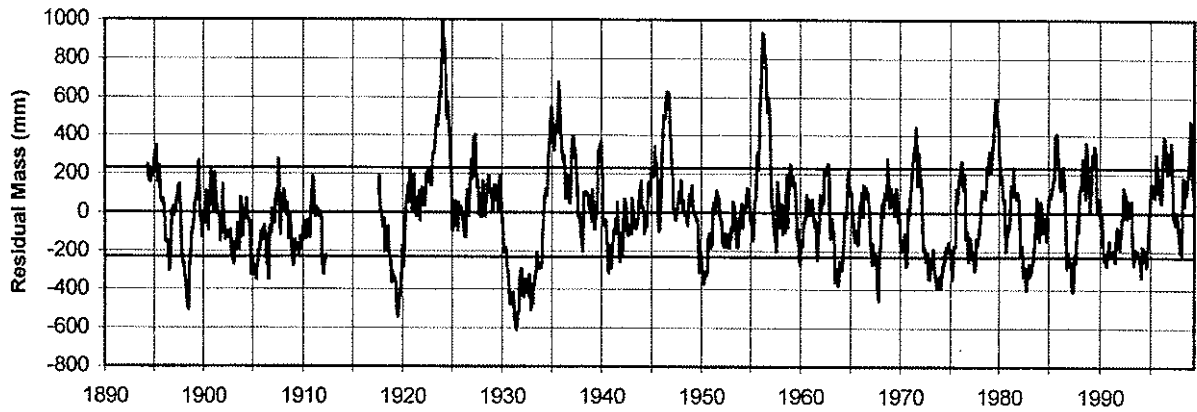


Kaitaia Weissing 530205

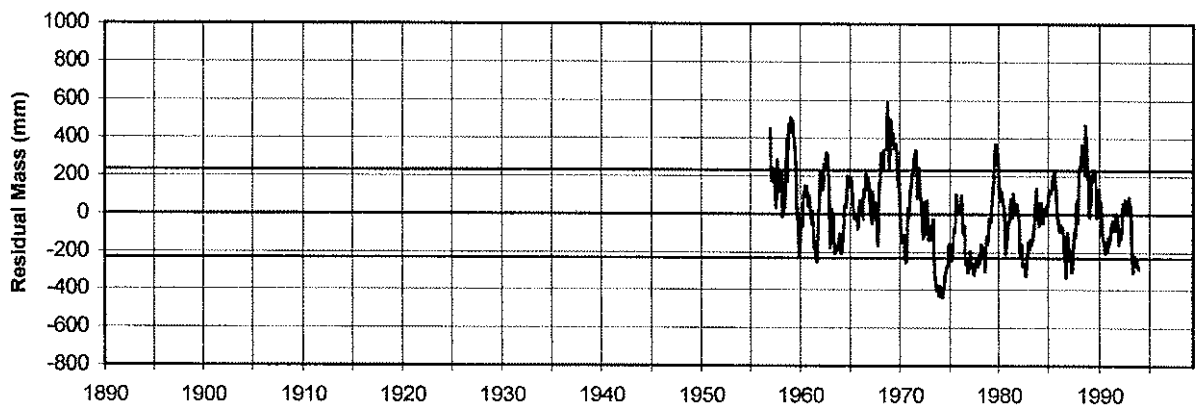


Moving Annual Residual Mass Rainfall Plots

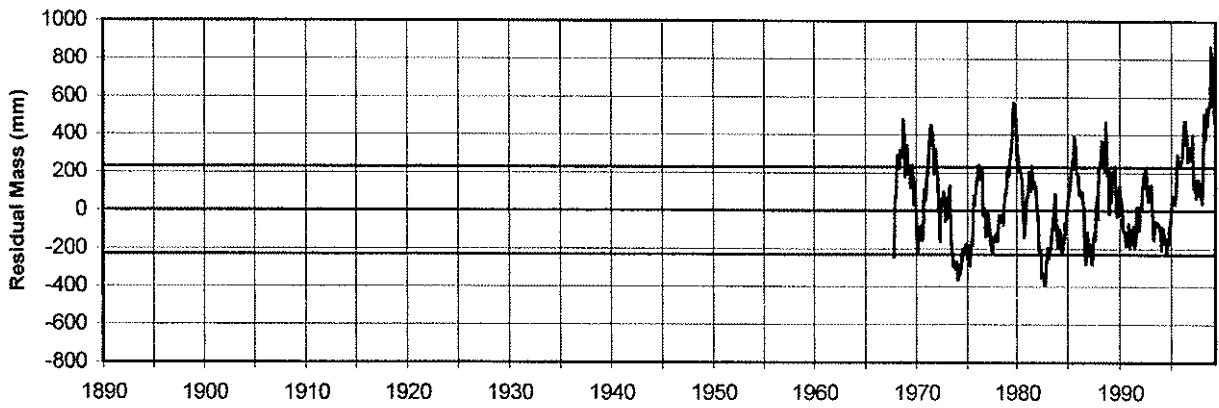
Kaitaia A53121



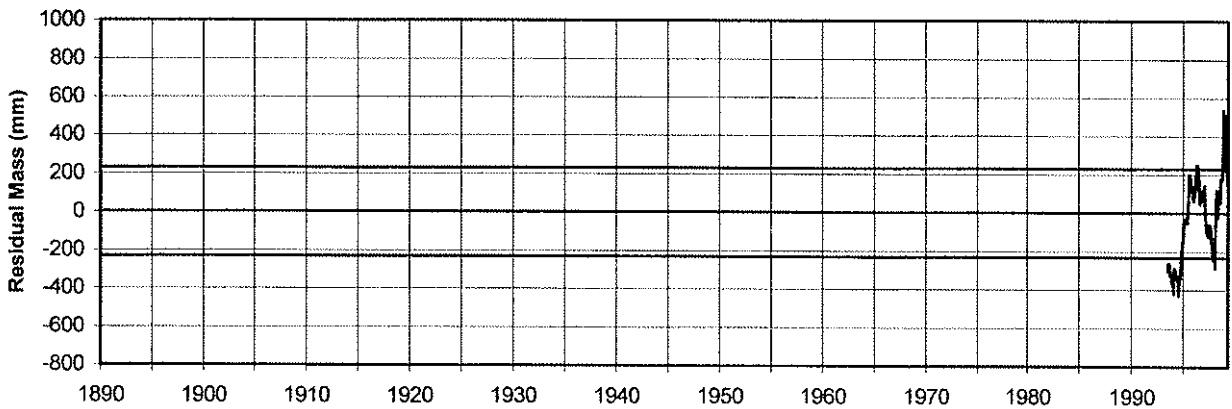
Waiharara A43921



Aupouri Forest 530204

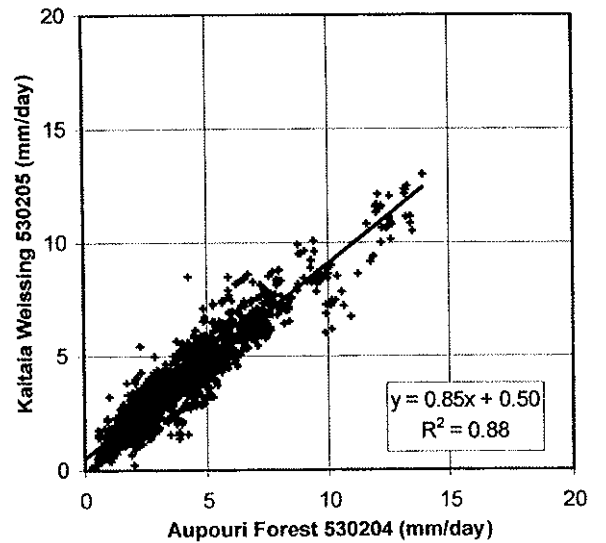
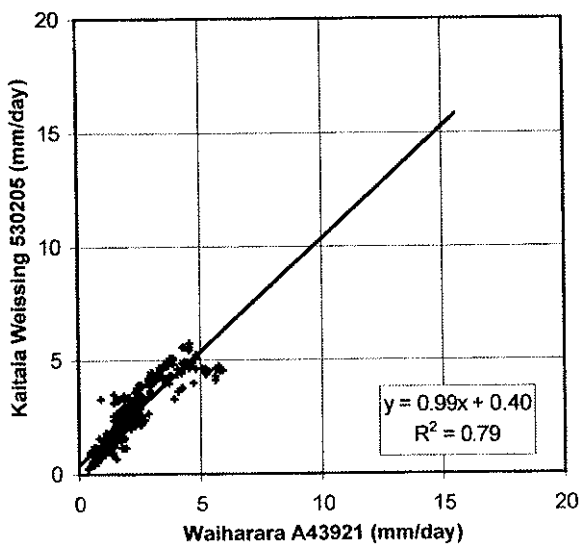
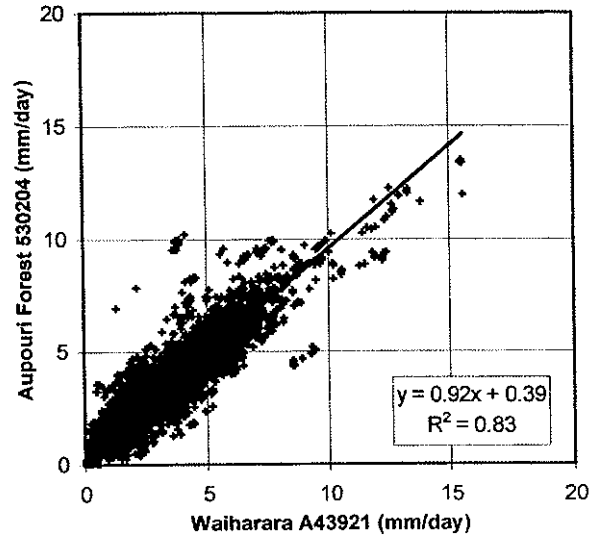
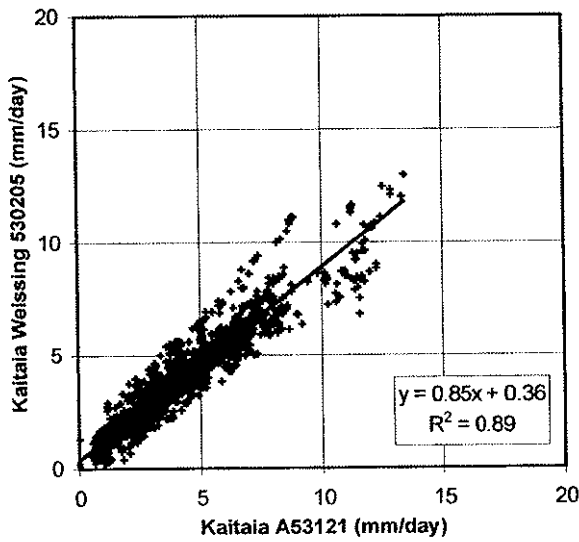
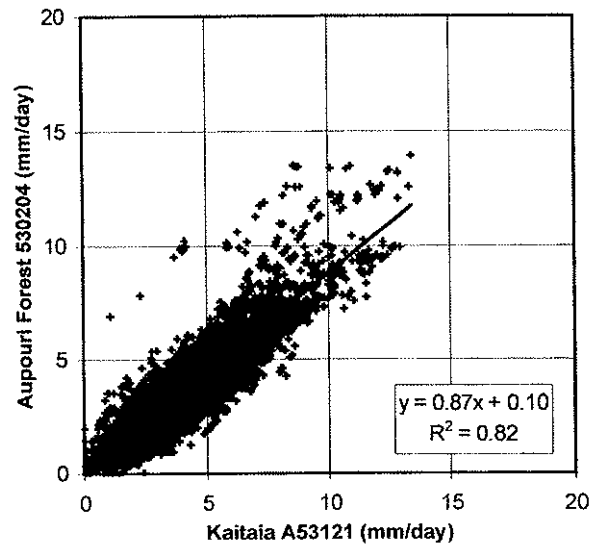
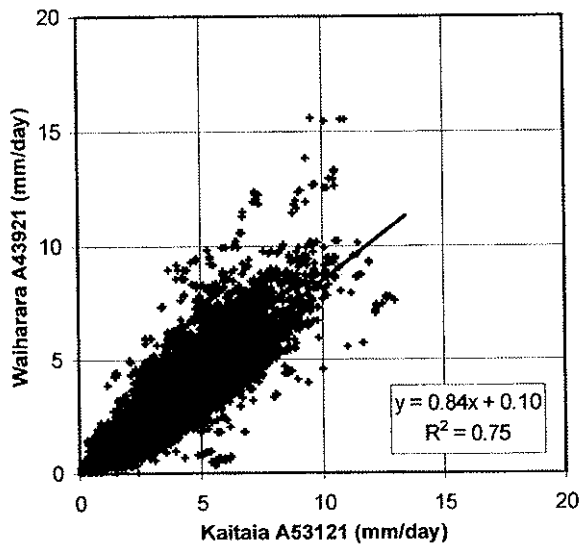


Kaitaia Weissing 530205



Note: Dashed lines indicate mean and one standard deviation.

Rainfall Correlation Charts (30-day Moving Average Rainfall)



Figures A3a to A3f