Supplementary Material

In the following, the relevant data sets and test results, together with the corresponding figures, are shown for each volcano, together with a short comment on the volcano characteristics and the fit quality.

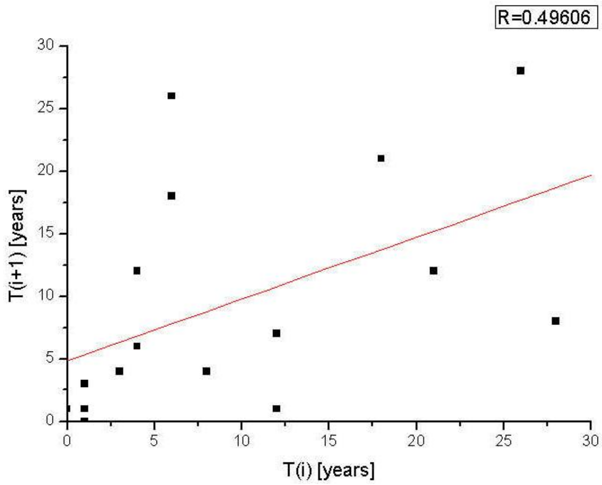
The names adopted for the repose time fit parameters are

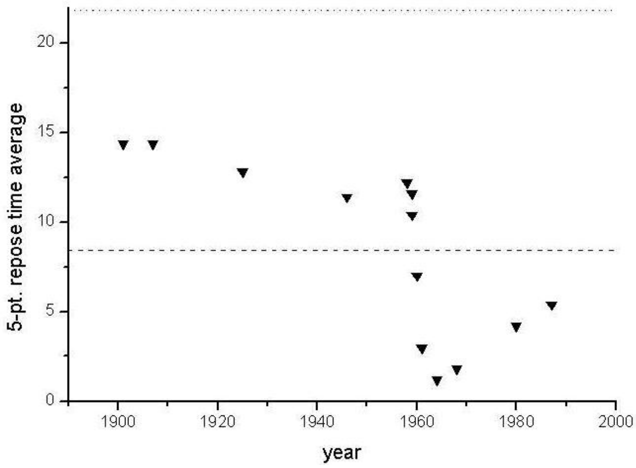
exponential distribution:	$y = A * \exp\left(-\frac{x}{t}\right)$
Weibull distribution:	$y = A * \exp\left(-(kx)^d\right)$
log-logistic distribution:	$y = A/(1 + \left(\frac{x}{x_0}\right)^p)$

Tupungatito

year	VEI	year	VEI	year	VEI
1829	2	1925	2	1961	2
1835	2?	1946	2	1964	2
1861	2	1958	2	1968	2
1889	2	1959	2	1980	2
1897	2	1959	2	1986	1
1901	2	1960	2	1987	2
1907	2				

Tupungatito Volcano is located in the high Andes east of Chile's capital Santiago, which is inhabited by six million people and by far Chile's most important industrial and commercial centre. The volcano built up since Pleistocene times in the Nevado Sin Nombre Caldera (Siebert and Simkin, 2002), its recent activity consists of 18 smaller historical eruptions, which produced a total erupted volume of about 6 km³ (Sruoga et al., 1993).





fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	15.17±0.36	10.57±0.39					0.384	0.978	0.097	14.0
	16± 0	9.97±0.27					0.442	0.974	0.095	14.0
WB	15.37±0.98		0.0970 ±0.009	0.9297 ±0.092			0.364	0.975	0.108	15.1
	16± 0		0.1023 ±0.003	0.8811 ±0.039			0.356	0.975	0.126	13.3
log	15.04±0.51				6.881 ±0.470	1.494 ±0.097	0.445	0.976	0.134	17.1
	16± 0				6.140 ±0.247	1.385 ±0.072	0.479	0.973	0.177	16.5

KS-threshold: 0.328 all fits pass the K-S-test

The difference in AIC_c for fixed vs. fit *A* is minor for all distribution functions.

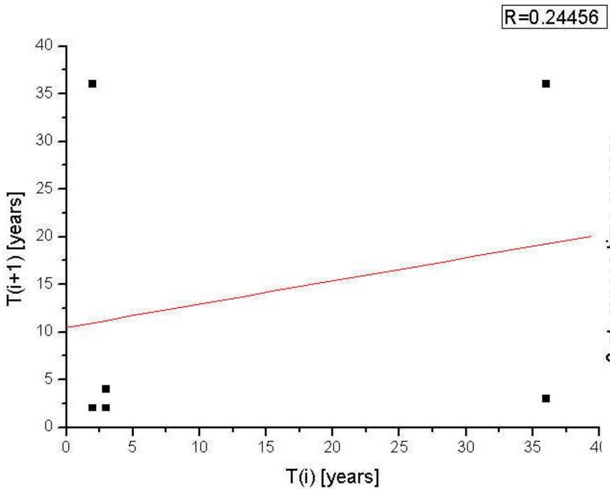
The Weibull and exponential function give a slightly better fit than the log-logistic function, but the difference in AIC_c is not marked enough to significantly prefer these models.

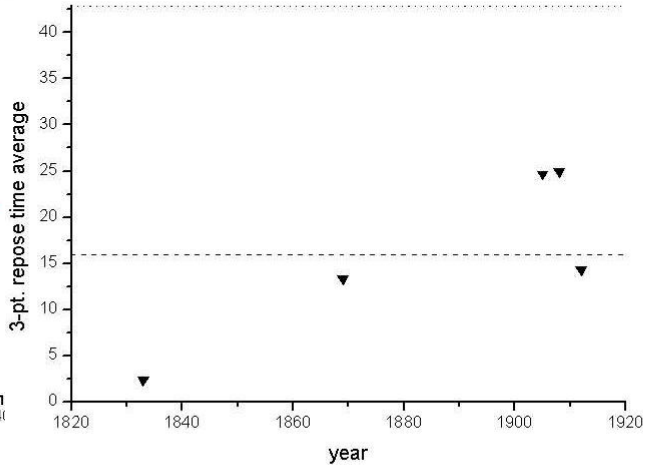
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	9.0	9.5	8.2	7.8	5.5	5.1
2	17.2	18.2	15.7	15.0	10.6	9.9
5	37.7	39.4	34.6	33.3	23.3	21.9
10	61.2	63.3	57.0	55.1	38.9	36.8
20	84.9	86.5	81.1	79.2	58.1	55.3
50	99.1	99.3	98.3	97.7	80.6	78.1
100	100.0	100.0	100.0	99.9	91.0	89.3
200	100.0	100.0	100.0	100.0	96.3	95.3
500	100.0	100.0	100.0	100.0	99.0	98.5
1000	100.0	100.0	100.0	100.0	99.6	99.4

Maipo

year	VEI	year	VEI
1826	2	1869	2
1829	2?	1905	2
1831	2	1908	2
1833	2	1912	2?

The ideally-shaped stratocone of Maipo Volcano is nested in the ~18 km diameter Diamante Caldera km that formed 450 ka BP (Sruoga et al., 2005). Seven historical eruptions of VEI = 2 occurred over the past 200 years. Despite its location in the wider Santiago region (Región Metropolitana), the volcano and its surroundings are developed for rustic tourism and therefore frequently visited.





fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	4.121±0.437	27.02±5.61					1.069	0.378	0.483	4.8
	7± 0	11.41±1.33					1.797	0.076	0.609	22.8
WB	fit cannot be performed									
	7± 0		0.1140 ±0.020	0.3281 ±0.062			0.550	0.503	0.388	-20.9
log	7.392±0.696				2.684 ±1.173	0.5523 ±0.093	0.491	0.722	0.342	-22.7
	7± 0				3.190 ±0.807	0.5622 ±0.091	0.482	0.719	0.367	-24.7

KS-threshold: 0.486 all fits pass the KS-test except the exponential function for fixed *A*
The Weibull function cannot be fit stably when *A* is a free parameter.

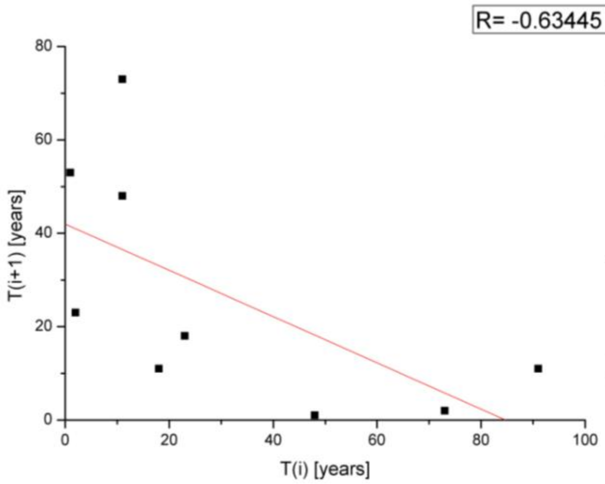
In the case of the exponential, the AIC_c for fixed *A* is much worse than for variable *A*. For the log-logistic distribution, this difference is not so pronounced, but the fit is somewhat better for fixed *A*.
The AIC_c of the exponential function (both for fit and variable *A*) is significantly worse than for the Weibull and log-logistic function, indicating that the exponential function provides a less satistfactory fit to the data. The log-logistic distribution performs better than the Weibull, which is still considerably better than the exponential distribution.

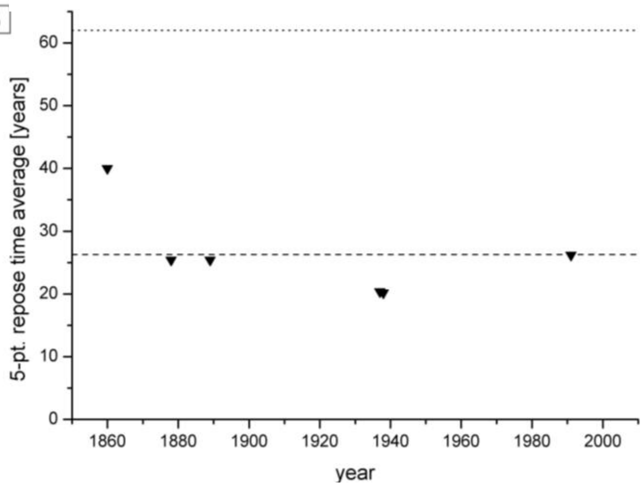
T [years]	Exp_var	Exp_const	WB_const	Log_var	Log_const
0	0	0	0	0	0
1	3.63	8.39	0.73	0.49	0.50
2	7.14	16.08	1.46	0.98	0.99
5	16.90	35.48	3.57	2.39	2.42
10	30.94	58.37	6.90	4.62	4.67
20	52.30	82.67	12.95	8.68	8.76
50	84.29	98.75	27.36	18.36	18.54
100	97.53	99.98	43.61	29.45	29.74
200	99.94	100	62.17	42.72	43.12
500	100	100	83.27	60.14	60.63
1000	100	100	93.07	71.10	71.61

Planchón-Peteroa

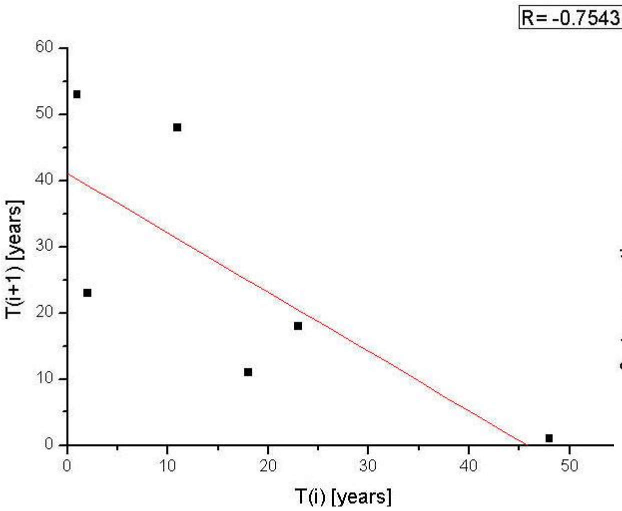
Planchón-Peteroa is a compound volcanic edifice, where several interlaced calderas host the three volcanic centres Planchón, Peteroa, and Azufre, the latter of which collapsed at about 11.5 ka BP (Tormey et al., 1995). The largest historical eruption (VEI = 4) occurred in 1762, thereafter the volcano calmed to a series of smaller eruptions of VEI = 2, while the most recent eruptions during the past fifty years only reached a VEI of 1. The volcanic complex is flanked by a border crossing road to Argentina.

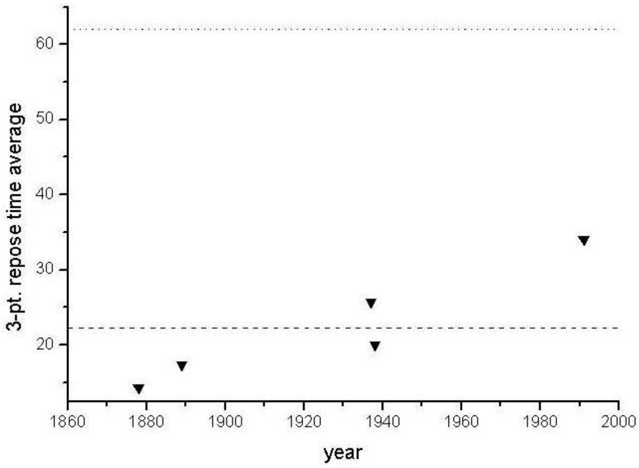
year	VEI	year	VEI	year	VEI
1660	>=3	1878	2	1960	1
1751	2	1889	2	1962	1
1762	4	1937	2	1967	1?
1835	2	1938	2	1991	2
1837	2	1959	1	1998	1
1860	2				





As Planchón-Peteroa fails the test for independence, the analysis is repeated for eruptions after the year 1835.



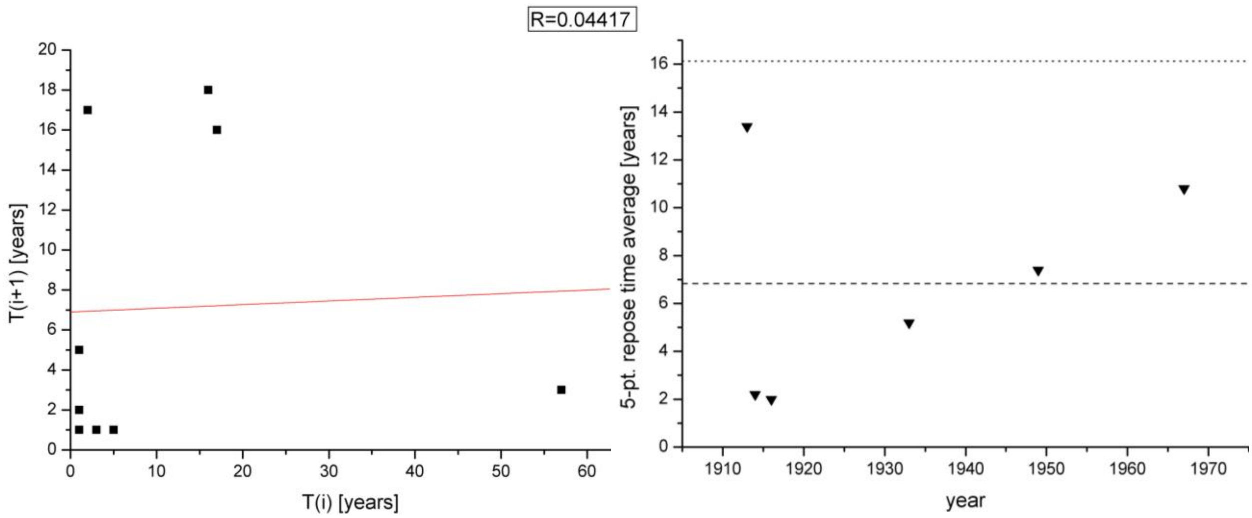


Still, the independence of successive eruptions cannot be ascertained, as the correlation coefficient points to a significant correlation (95% level of significance). Planchón-Peteroa is therefore excluded from the following analyses.

Quizapu-Cerro Azul

Historical eruptions of Cerro Azul took place through the parasite vent of Quizapu on its northern flank. The volcano is part of the larger Cerro Azul - Descabezado Grande - Resolana volcanic complex, characterised by several major stratovolcanoes and numerous small vents (Hildreth and Drake, 1992). Quizapu has produced one strong eruption in historical times, which is listed on the GVP-webpage as beginning in 1916 and lasting till 1932, although the major 9.5 km^3 Plinian explosion took place in 1932. The influence of the exact onset date of this eruption on the statistical analysis is minor in this case, because it only switches the order of two repose times of 1-2 years and 16-17 years, respectively, which would rather smoothen the cumulative frequency plot and strengthen the stationary property of the data set. Since this VEI = 5+ eruption did not occur at the beginning of the eruption record but interspersed in a time interval with VEI = 2 eruptions, the record is considered to be complete and reliable. The VEI 5+ eruption followed the second strongest eruption of VEI = 3, suggesting that the volcano was experiencing an episode of particularly fierce activity. The region around the volcano is intensely used: Major hydroelectrical power plants are constructed in the valley downstream of the volcano; several precious natural reserves attract a large number of tourists. Having been an *ordinary* border crossing to Argentina for a long time, the road connecting the Chilean metropole Talca with the Argentinian city of Malargüe via the Paso Pehuenche is currently upgraded and paved to become a major international hub.

year	VEI
1846	2
1903	2
1906	2
1907	2
1912	2
1913	2?
1914	3
1916	5+
1933	2
1949	2?
1967	2?



fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	7.264±0.36	15.36±1.12					0.552	0.853	0.323	34.4
	10± 0	10.34±0.63					0.961	0.740	0.248	55.8
WB	8.316±1.20		0.08587 ±0.0228	0.6569 ±0.1106			0.344	0.874	0.181	24.6
	10± 0		0.12336 ±0.0083	0.5407 ±0.0330			0.345	0.871	0.276	23.0
log	9.297±0.57				4.900 ±0.818	0.9772 ±0.0773	0.394	0.897	0.175	27.3
	10± 0				4.058 ±0.377	0.9199 ±0.0594	0.395	0.895	0.216	25.7

KS-threshold: 0.410 all fits pass the KS-test

The AIC_c is comparable for fixed vs. fit A in case of the Weibull and log-logistic distribution, but considerably worse for the exponential distribution.

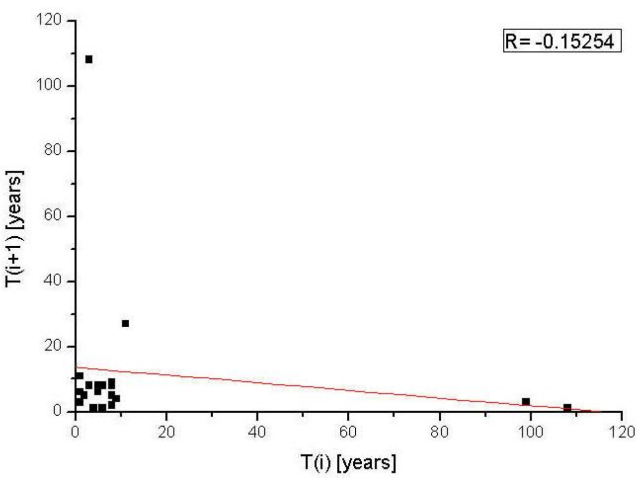
The exponential gives a less satisfactory fit that the Weibull; the log-logistic distribution, while not giving as good a fit as the Weibull distribution, still performs satisfactorily.

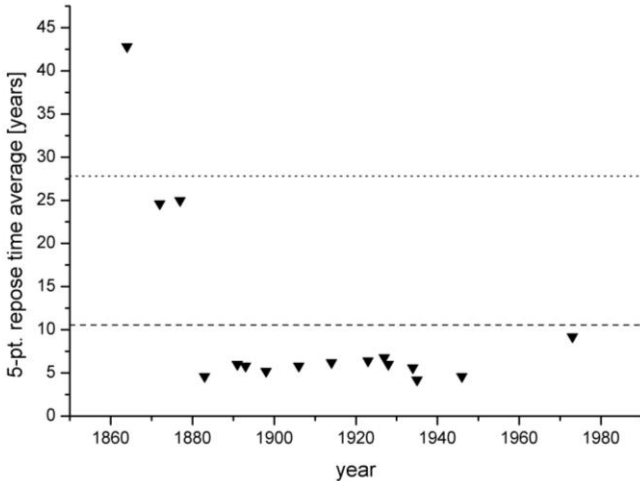
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	6.3	9.2	3.6	3.1	2.0	1.9
2	12.2	17.6	7.0	6.0	4.0	3.8
5	27.8	38.3	16.3	14.2	9.4	8.9
10	47.8	62.0	29.5	25.8	17.1	16.3
20	72.8	85.5	49.2	43.5	29.2	27.8
50	96.1	99.2	79.1	72.3	50.6	48.6
100	99.9	100.0	94.2	89.7	67.1	64.9
200	100.0	100.0	99.3	97.9	80.2	78.2
500	100.0	100.0	100.0	99.9	90.9	89.5
1000	100.0	100.0	100.0	100.0	95.2	94.2

Nevados de Chillán

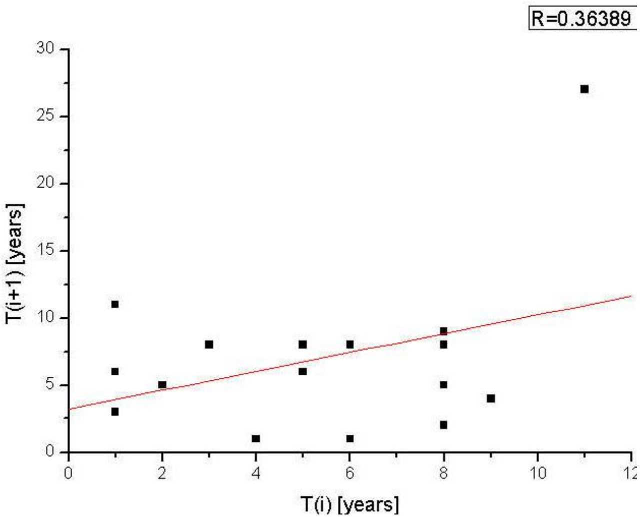
A series of major vents are aligned in an NNW-SSE trending direction at Nevados de Chillán, accompanied by several satellite vents (Dixon et al., 1999). Despite only one VEI = 1 eruption in the past 37 years and some uncertainty in the recording, the volcano has been reported to show fairly continuous activity in the VEI = 2-3 range over the past centuries. The volcanic edifice is used as a ski resort, with accomodation facilities at all levels and prolific thermal springs, thus giving rise to the need of volcanic risk evaluation because of the omnipresence of humans in this area. Indeed, Chillán was classified as “one of the highest-risk volcanoes in Chile” by Dixon et al. (1999).

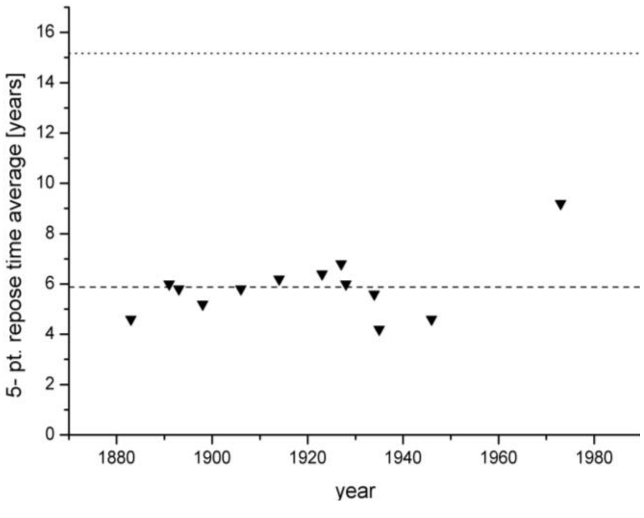
year	VEI	year	VEI	year	VEI
1650	3?	1883	2?	1927	2?
1749	3+	1891	2	1928	2?
1752	2?	1893	2	1934	2?
1860	2?	1898	2	1935	2?
1861	2	1906	2	1946	2?
1864	3	1907	1	1973	2?
1872	2	1914	2	2003	1
1877	2	1923	2?		





The first sample of the 5-point moving average of repose times falls out of the range of expected variation. Therefore, it may be that the eruption record at early times is not complete. We repeat the analysis for eruptions after 1860.





The restricted eruption record passes the tests for independence and stationarity. The following analyses are therefore based on this shortened record.

Nevados de Chillán, from 1860

fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	17.92±0.74	5.805±0.37					1.111	0.957	0.224	31.8
	17± 0	6.100±0.31					1.136	0.955	0.206	31.5
WB	14.22±0.76		0.1384 ±0.0065	2.071 ±0.279			0.701	0.966	0.168	22.8
	17± 0		0.1583 ±0.0061	1.358 ±0.106			0.853	0.957	0.164	25.3
log	15.15±0.56				5.465 ±0.294	2.645 ±0.242	0.727	0.973	0.170	23.5
	17± 0				4.688 ±0.215	2.170 ±0.170	0.929	0.964	0.182	27.2

KS-threshold: 0.318 all fits pass the KS-test

For the exponential distribution, the difference in AIC_c for fit vs. fixed *A* is irrelevant. In the case of the Weibull and the log-logistic disitributions, keeping *A* fixed results in slightly worse AIC_c.

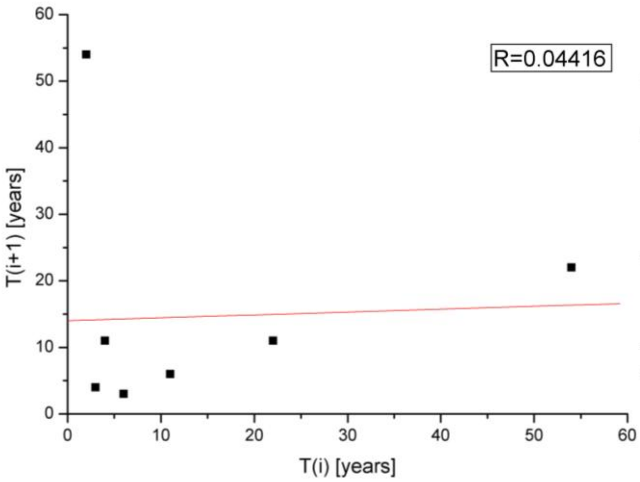
The Weibull and log-logistic distributions give comparable AIC_c, while performing better than the exponential distribution.

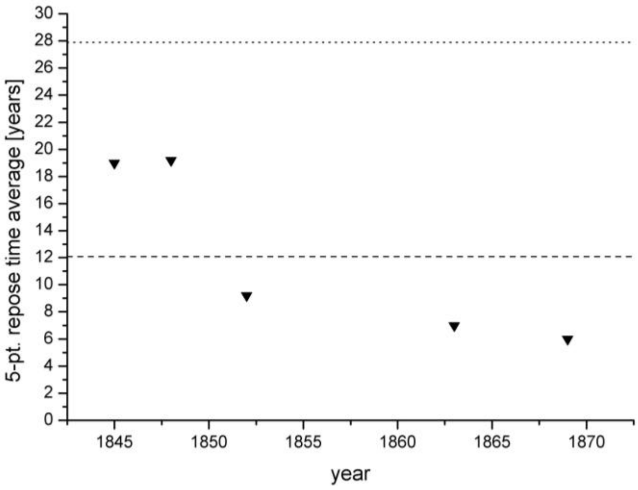
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	15.8	15.1	80.3	33.1	6.9	5.7
2	29.1	28.0	96.3	55.5	13.2	11.0
5	57.7	55.9	100.0	87.1	29.0	24.4
10	82.1	80.6	100.0	98.5	47.5	41.0
20	96.8	96.2	100.0	100.0	68.8	61.4
50	100.0	100.0	100.0	100.0	89.9	84.7
100	100.0	100.0	100.0	100.0	97.0	94.4
200	100.0	100.0	100.0	100.0	99.3	98.3
500	100.0	100.0	100.0	100.0	99.9	99.7
1000	100.0	100.0	100.0	100.0	100.0	99.9

Antuco

Antuco Volcano is a youthful cone constructed during the Holocene (Lohmar et al., 2005). In historical times, twelve mildly to moderately explosive eruptions took place within 120 years, ceasing in 1869. Antuco is situated at the Paso Pichachén to the east of the city of Los Angeles and its industrial and agricultural zones. Due to the easy road access, the volcano and the national park Laguna de las Lajas are intensely visited for skiing and recreation.

year	VEI	year	VEI	year	VEI
1750	2	1828	2	1852	3
1752	3?	1839	2	1861	0
1806	2?	1845	2	1863	2
1820	1	1848	2?	1869	2





While the independence and stationarity tests are confirmed, an upcoming eruption in or after 2010 would move the last 5-point average beyond the 1sigma-limit and cast doubt on the presumed stationarity.

fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	8.70±0.35	11.67±0.68					0.410	0.912	0.167	25.0
	9± 0	11.20±0.48					0.407	0.911	0.163	23.6
WB	18.36±3.49		0.3638 ±0.1637	0.4299 ±0.0569			0.179	0.954	0.582	15.2
	9± 0		0.0926 ±0.0044	0.7656 ±0.0441			0.310	0.919	0.240	21.0
log	9.55±0.32				5.9436 ±0.4500	1.2867 ±0.0620	0.157	0.667	0.198	14.1
	9± 0				6.5946 ±0.2693	1.3435 ±0.0568	0.164	0.965	0.168	12.2

KS-threshold: 0.432 all fits pass the KS-test, except the Weibull distribution in case for *A* is varied

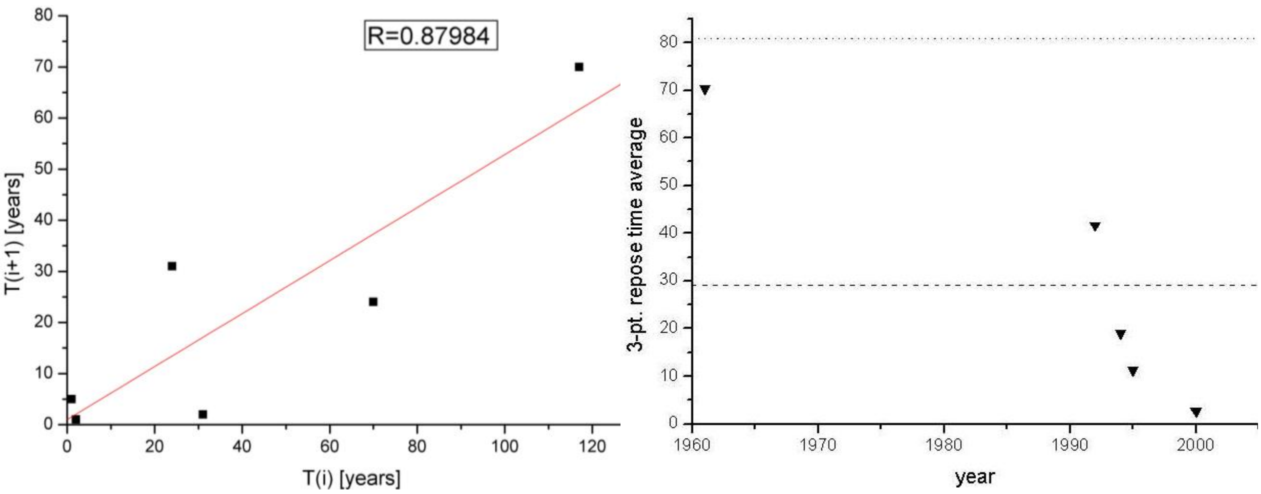
The AIC_c only shows small differences whether *A* is fixed or fit for the exponential and log-logistic distribution. It is considerably worse for the Weibull function when *A* is fixed. The Weibull and log-logistic distribution are consistently better than the exponential.Whether the improvement in AIC_c for the log-logistic over the Weibull function is relevant or not depends on whether *A* is fixed or not.

T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	8.2	8.5	1.6	3.8	0.9	0.9
2	15.7	16.3	3.3	7.5	1.8	1.9
5	34.8	36.0	7.9	17.6	4.3	4.5
10	57.5	59.0	15.0	32.0	8.4	8.7
20	82.0	83.2	27.4	53.5	15.6	16.2
50	98.6	98.8	53.2	84.6	32.1	33.3
100	100.0	100.0	75.6	97.4	49.6	51.1
200	100.0	100.0	91.9	99.9	67.7	69.3
500	100.0	100.0	99.3	100.0	85.6	86.8

Copahue

The stratocone of Copahue Volcano is situated inside the giant Caviahue Caldera (Naranjo and Polanco, 2004, Melnick et al., 2006). Being ice-capped even in summer times and with lake-occupied craters, the presence of water contributes a hazard of lahars and phreatomagmatic explosivity to the overall eruption threat. Volcanic activity in the historical record has been characterised by uniformly VEI = 2 eruptions. Nevertheless, the volcano is recreationally developed for skiing and hiking, including a construction boom in the past decades of touristic infrastructure in the Argentinian township of Caviahue right at the eastern foot of the volcano. To the west, the valley of Biobio descends from the volcanoes Copahue and its neighbour Callaqui, intensely used for hydroelectricity and recreation.

year	VEI
1750	2
1867	2?
1937	2?
1961	2
1992	2
1994	2
1995	2
2000	2



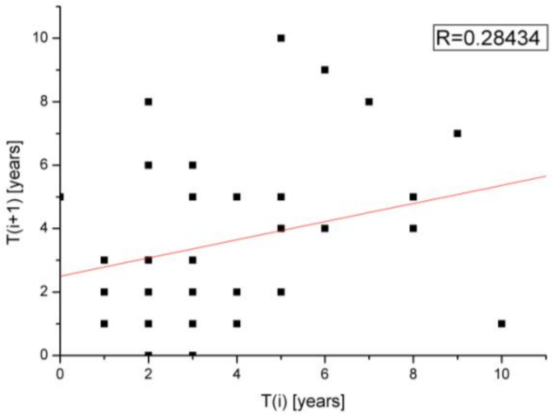
Copahue fails the test for independence. Any further restriction of the record is impossible since only very few historical eruptions are documented. Therefore, Copahue cannot be analysed further in this context.

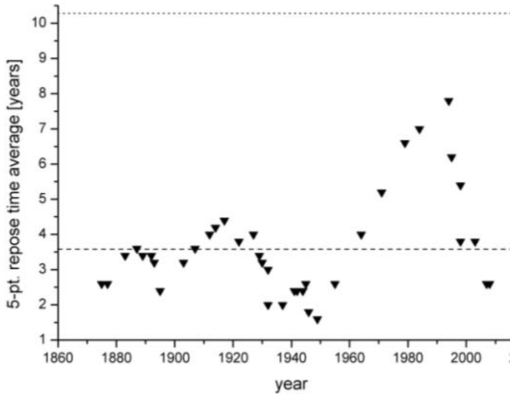
Llaima

Llaima volcano has built up since late-Pleistocene age and gone through an episode of highly-explosive activity between 13 and 7 ka BP, during which it produced several Plinian eruptions, accompanied by a caldera collapse (Naranjo and Moreno, 2005; Stern, 2004). The historical activity is characterised by numerous smaller explosions, effusive eruptions, and quiescent degassing. Llaima is classified as one of the currently most active volcanoes of South America.

year	VEI	year	VEI	year	VEI	year	VEI	year	VEI
1852	2	1889	2	1927	2	1945	3	1994	2
1862	3	1892	2	1929	2	1946	2	1995	2
1864	3	1893	2	1930	2	1949	2	1997	1
1866	2	1895	2	1932	2	1955	3	1998	2
1869	2	1903	2	1932	3	1964	2	1998	2
1872	2	1907	2	1937	2	1971	2	2002	1
1875	2	1912	2	1938	1	1979	2	2003	2
1877	2	1914	2	1941	2	1984	2	2007	2
1883	2	1917	2	1942	2	1990	2	2008	3
1887	2	1922	2	1944	2	1992	1		

It was shown by Dzierma and Wehrmann (2010) that the eruption record of Llaima is consistent with Poissonian behaviour if it is restricted to eruptions from the year 1860 on. The stationarity and independence tests are shown for completeness.





fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	42.26±1.45	3.144± 0.18					2.895	0.986	0.296	27.2
	40 ±0	3.307± 0.17					3.347	0.982	0.279	32.1
WB	40.43 ±2.23		0.294±0.02	1.281±0.104			0.513	0.997	0.222	9.6
	40 ± 0		0.291±0.01	1.299±0.042			0.451	0.997	0.215	7.6
log	38.93± 1.30				2.5645 ±0.1482	2.161 ± 0.178	2.052	0.991	0.194	20.4
	40 ± 0				2.4712 ±0.0984	2.087 ± 0.144	1.964	0.991	0.215	19.7

KS-threshold: 0.215 The exponential function does not pass the KS-test at the 5% level.
If *A* is fixed, both the Weibull and log-logistic distributions pass the KS-test; the Weibull function fails if the scale *A* is varied. The small difference in the fit parameters from the results by Dzierma and Wehrmann (2010) is due to a slightly different implementation of the fitting procedure.
In the case of the exponential distribution, the AIC_c is much worse for fixed *A*. For the Weibull distribution, the difference in AIC_c between the fits for fixed vs. variable *A* is not pronounced, with slightly better result when *A* is fixed. For the log-logistic distribution, the differences in AIC_c are slight. The best fit to the data according to the AIC_c is achieved by the Weibull function, considerably better than the log-logistic function. The exponential distribution gives the worst AIC_c result.

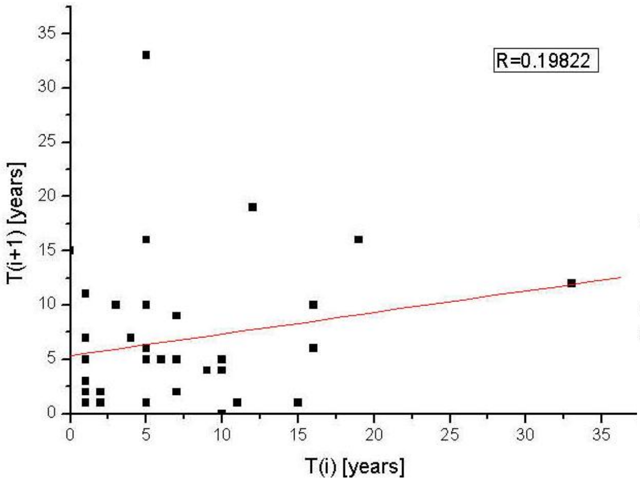
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	27.2	26.1	25.8	25.5	28.6	29.9
2	47.1	45.4	47.4	46.9	53.0	53.9
5	79.6	78.0	84.4	84.0	84.5	84.4
10	95.8	95.1	98.6	98.5	95.3	95.1
20	99.8	99.8	100.0	100.0	98.8	98.7
50	100.0	100.0	100.0	100.0	99.8	99.8
100	100.0	100.0	100.0	100.0	100.0	100.0

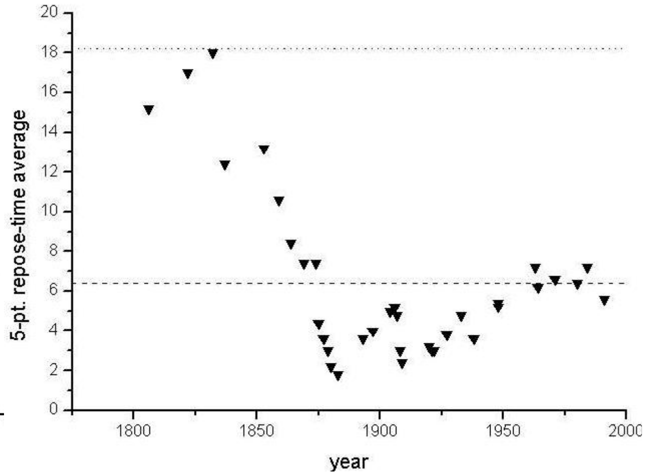
Villarrica

Situated on the intersection of the large Liquine-Ofqui-Fault Zone with the Mocha-Villarrica Fracture Zone, Villarrica volcano went through multiple caldera-forming events since Mid- to Late Pleistocene. The present-day snow-capped stratocone grew over the past 14 ka, the summit crater is occupied by a small lava lake. Highly-frequent but rather small eruptions dominate the historical record, which contains about 50 eruptions in the last 400 years. Villarrica belongs to Chile's most popular tourist attractions, where outdoor activities are promoted and the corresponding entertainment infrastructure is rapidly growing in the townships nearby. Historical eruptions of Villarrica are thoroughly documented (Moreno et al., 1994, Lara and Clavero, 2004) and have been statistically analysed by, e.g., Muñoz, 1983, Dzierma and Wehrmann, 2010)

Dzierma and Wehrmann (2010) showed that Poissonian behaviour can be presumed for the eruption record starting in the year 1730. Again, the stationarity and independence tests are shown for completeness.

year	VEI	year	VEI	year	VEI	year	VEI
1730	2	1859	2	1920	2	1964	2
1737	2	1864	2	1921	2	1971	2
1742	2	1869	2	1922	2	1977	1
1745	1	1874	2	1927	2	1980	2
1751	1	1875	2	1929	1	1983	1
1759	1	1877	2	1933	2	1984	2
1775	2	1879	2	1935	1	1991	2
1777	1	1880	2	1938	1	1992	1
1780	1	1883	2	1938	2	1994	1
1787	2	1893	2	1947	1	1995	1
1790	1	1897	2	1948	2	1996	1
1806	2	1904	2	1948	3	1996	1
1815	1	1906	2	1956	1	1998	1
1822	2	1907	2	1958	1	2003	1
1832	2	1908	2	1960	1	2004	1
1837	2	1909	2	1961	1	2008	1
1853	2	1915	1	1963	3		





fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	37.86±0.74	6.409±0.19					1.177	0.989	0.173	7.85
	38 ± 0	6.385±0.14					1.142	0.989	0.175	5.63
WB	33.88±1.45		0.1361 ±0.0067	1.2183 ±0.0854			1.006	0.988	0.126	17.94
	38 ± 0		0.1554 ±0.0037	1.0375 ±0.0380			1.181	0.985	0.168	6.90
log	34.02±0.94				5.233 ±0.246	2.0512 ±0.1156	1.700	0.984	0.178	21.69
	38 ± 0				4.407 ±0.167	1.7822 ±0.0916	2.377	0.977	0.188	31.77

Again, the small deviation in fit parameters from the results by Dzierma and Wehrmann (2010) is due to the slightly modified fitting procedure, which does not account for non-finite repose times.

KS-threshold: 0.21 all fits pass the KS-test

The AIC_c is comparable for both fits in the case of the exponential distribution. For the log-logistic distribution, the AIC_c is worse if *A* is fixed, and vice versa for the Weibull distribution.

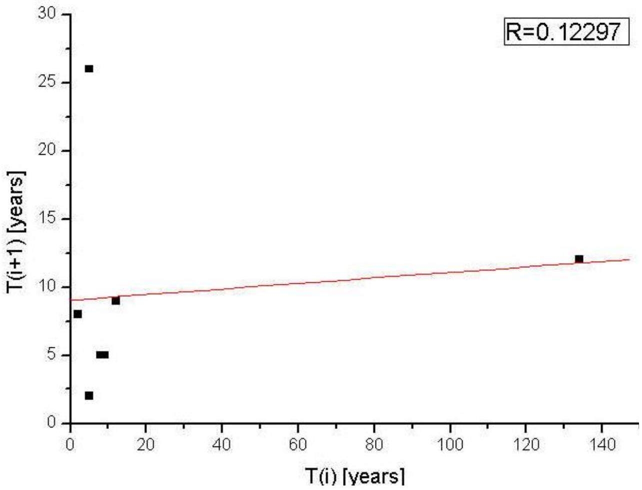
The exponential distribution gives the best fit to the data, the log-logistic the worst. The Weibull function performs intermediately, with good quality for fixed *A* (comparable to the exponential function) and much worse for variable *A*, though still better than the log-logistic distribution.

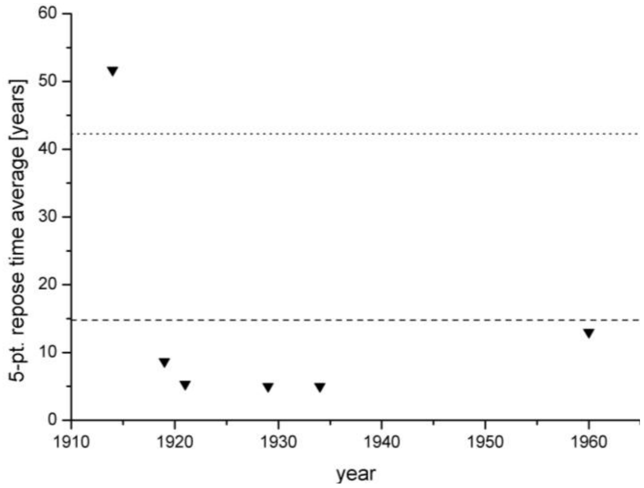
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0	0	0	0	0	0
1	14.45	14.50	18.56	15.47	9.39	8.18
2	26.81	26.89	33.82	28.57	17.55	15.38
5	54.17	54.30	64.94	56.97	36.48	32.47
10	78.99	79.12	88.30	81.61	56.33	51.15
20	95.59	95.64	98.85	96.69	75.91	70.79
50	99.96	99.96	100	99.98	92.45	89.29
100	100	100	100	100	97.52	95.93
200	100	100	100	100	99.29	98.62
500	100	100	100	100	99.88	99.70
1000	100	100	100	100	99.97	99.91

Puyehue-Cordón Caulle

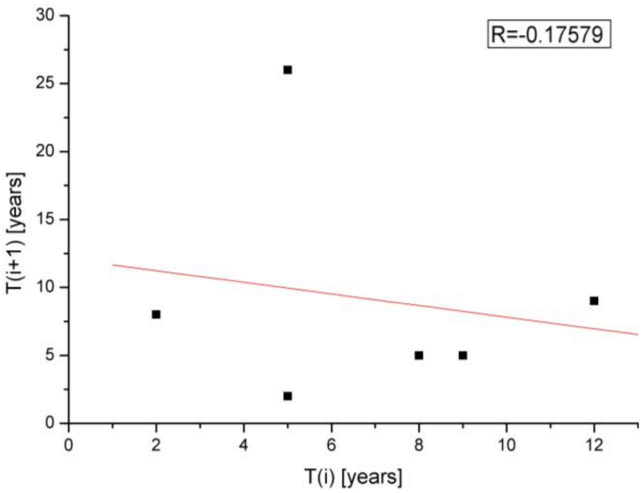
The Puyehue-Cordon Caulle Volcanic Complex is an extensive volcanic complex consisting of multiple stratocones and fissure vents (Lara et al., 2006; Singer et al., 2008). Besides nine other eruptions in the historical record, Puyehue was the volcano that showed an immediate eruptive response to the 9.5 Mw Valdivia earthquake in 1960. With regard to the thread emerging from this volcano it should be considered that Puyehue is situated centrally in Chile's lake district, praised for touristical attractiveness and favourable living conditions, therefore intensely populated.

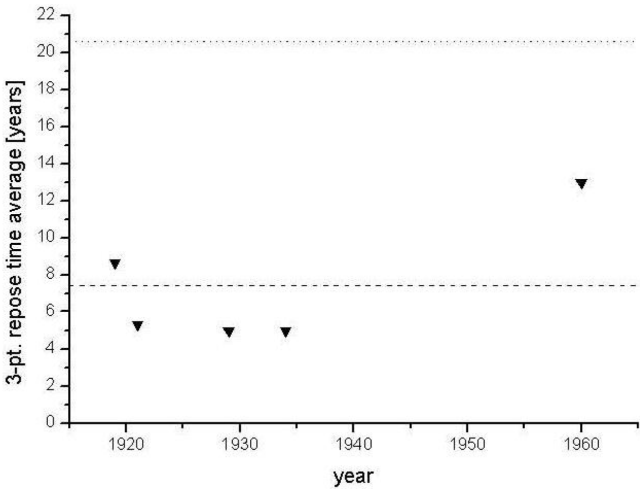
year	VEI	year	VEI
1759	2?	1921	3
1893	2?	1929	2
1905	2?	1934	2
1914	2	1960	3?
1919	2	1990	1





The first 5-point moving repose time average falls outside the range expected for stochastic variation. We therefore suspect the eruption record at early times to be incomplete. The record is restricted to the time after 1893, and the tests are repeated.





The restricted eruption record passes both tests, so the following analyses are based on the historical eruption record from 1893 on.

Puyehue-Cordón Caulle from 1893

fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	7.732±0.31	8.429±0.53					0.255	0.948	0.3045	10.1
	7± 0	9.336±0.50					0.301	0.936	0.273	25.7
WB	8.324±0.89		0.1285 ±0.0186	0.9772 ±0.1507			0.239	0.946	0.335	11.5
	7± 0		0.1060 ±0.0048	1.2311 ±0.1070			0.267	0.937	0.224	10.4
log	7.048±0.28				6.708 ±0.449	2.005 ±0.171	0.169	0.967	0.214	9.9
	7± 0				6.768 ±0.274	2.022 ±0.143	0.163	0.967	0.209	7.9

KS-threshold: 0.486 all fits pass

For the exponential distribution, the AIC_c is considerably worse when *A* is fixed. The AIC_c of the Weibull and log-logistic distribution is comparable whether or not A is fixed.

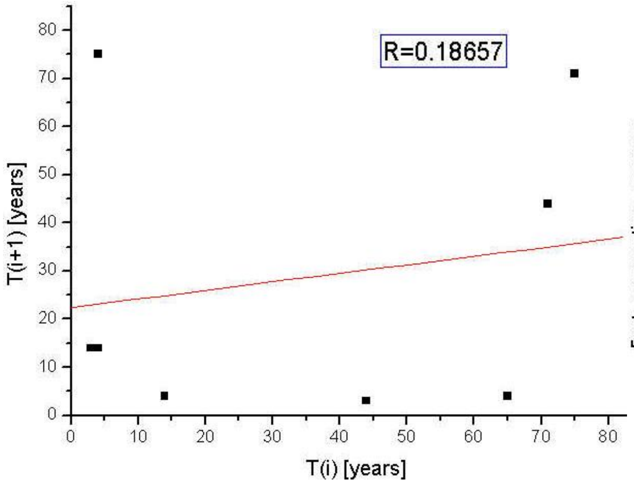
The three fit functions perform similarly well according to the AIC_c, except the exponential in the case where A is fixed.

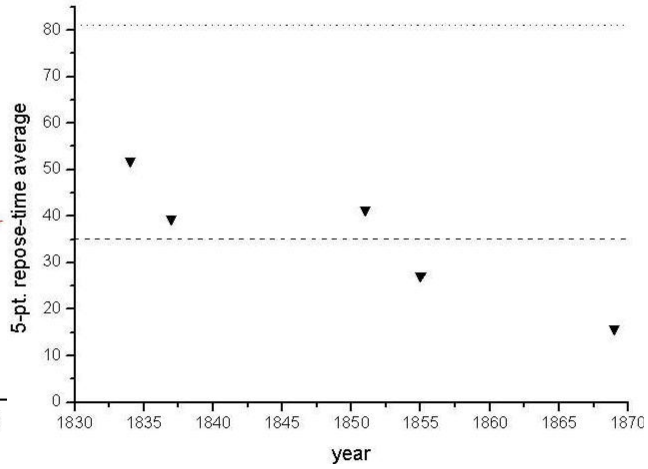
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	11.2	10.2	11.3	17.4	3.9	3.9
2	21.1	19.3	21.4	31.9	7.6	7.6
5	44.7	41.5	45.2	61.9	17.4	17.6
10	69.5	65.7	69.9	85.8	30.7	30.9
20	90.7	88.3	90.9	98.1	49.2	49.5
50	99.7	99.5	99.7	100.0	75.3	75.6
100	100.0	100.0	100.0	100.0	89.1	89.3
200	100.0	100.0	100.0	100.0	96.1	96.2
500	100.0	100.0	100.0	100.0	99.2	99.2
1000	100.0	100.0	100.0	100.0	99.8	99.8

Osorno

Osorno stratovolcano is located around 80 km South-East of Osorno city, between the lakes Todos los Santos and Llanquihue. This perfectly shaped cone made of aa lavas and pyroclastic material (Lopez-Escobar et al., 1992, 1995) is formed on a basement of sediments and Miocene plutonic rocks. Recent volcanic activities occurred at the summit crater and at several young satellite cones. The summit area and upper slope are covered by a glacier, and are also a touristic destination for skiing and hiking.

year	VEI	year	VEI	year	VEI
1575	2	1765	1	1851	2?
1640	2	1790	2	1855	2?
1644	2	1834	3?	1869	2
1719	2	1837	2		





fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	7.24±0.23	52.46±3.11					0.558	0.818	0.321	44.8
	9± 0	38.76±1.55					0.941	0.689	0.252	71.6
WB	11.51±1.93		0.04408 ±0.01933	0.4187 ±0.0871			0.404	0.855	0.349	35.1
	9± 0		0.02548 ±0.00108	0.5822 ±0.0371			0.414	0.849	0.232	34.2
log	9.30±0.53				17.808 ±3.124	0.7848 ±0.0719	0.423	0.864	0.24446	36.5
	9± 0				19.573 ±1.051	0.8151 ±0.0522	0.420	0.863	0.25069	34.6

KS-threshold: 0.432 all fits pass the KS-test

AI C_c: The exponential function again performs better if *A* is variable.

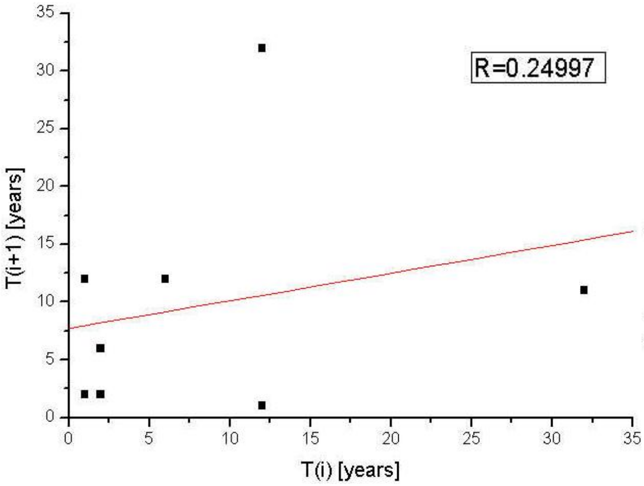
The AIC_c is comparable for both the Weibull and log-logistic fit (both A fit and A fixed). In both cases, it is and considerably better than for the exponential.

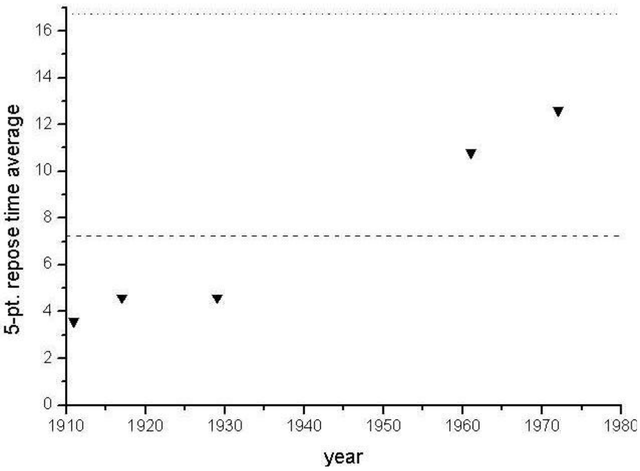
T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	1.9	2.5	0.6	0.9	0.5	0.5
2	3.7	5.0	1.3	1.7	0.9	1.0
5	9.1	12.1	3.1	4.2	2.3	2.4
10	17.4	22.7	6.1	8.2	4.4	4.6
20	31.7	40.3	11.6	15.6	8.4	8.7
50	61.4	72.5	25.3	33.5	18.4	19.0
100	85.1	92.4	41.9	53.8	30.5	31.5
200	97.8	99.4	61.9	75.8	45.6	46.9
500	100.0	100.0	85.1	94.9	65.7	67.1
1000	100.0	100.0	95.1	99.3	77.7	79.0

Calbuco

The ragged-top stratovolcano Calbuco in the southern part of the volcanic chain considered here is located only 30 km away from the city of Puerto Montt. Puerto Montt is a fast-growing city, economically important and a major air and navigatory traffic gateway to the Southern Chilean Provinces and to Chiloé Island. The edifice of Calbuco Volcano grew over several stages since the Late-Pleistocene (Lopez-Escobar et al., 1995); the historical record, however, spans only over the last 120 years. Calbuco produced a relatively large number of higher-VEI eruptions (VEI 3 and 4), hence suggesting it may tend to rather fewer larger eruptions than, e.g., volcanoes with very frequent, but smaller eruptions like Villarrica.

year	VEI	year	VEI
1893	4	1911	2
1894	2?	1917	3?
1906	2	1929	3?
1907	2?	1961	3
1909	2	1972	2





While the independence and stationarity tests are confirmed, an upcoming eruption in or after 2010 would move the last 5-point average beyond the 1sigma-limit and cast doubt on the presumed stationarity.

fit	A	t	k	d	x0	p	χ^2/DoF	R^2	KS-diff.	AIC_c
exp.	7.798±0.39	9.675±0.73					0.442	0.908	0.258	17.3
	9± 0	8.261±0.48					0.547	0.883	0.229	18.9
WB	7.288±0.93		0.09657 ±0.01689	0.9696 ±0.1879			0.396	0.891	0.261	17.5
	9± 0		0.13209 ±0.00893	0.7309 ±0.0617			0.407	0.883	0.204	16.2
log	8.081±0.58				5.555 ±0.870	1.339 ±0.160	0.473	0.905	0.242	19.7
	9± 0				4.35 ±0.412	1.172 ±0.109	0.481	0.900	0.192	18.5

KS-threshold: 0.432 all fits pass the KS-test

The AIC_c is comparable for all fits, whether or not *A* is varied. The difference in AIC_c for different fit functions is slight, with slightly better performance for the Weibull function in comparison with the log-logistic function, and intermediate performance of the exponential function.

T [years]	Exp_var	Exp_const	WB_var	WB_const	Log_var	Log_const
0	0.0	0.0	0.0	0.0	0.0	0.0
1	9.8	11.4	8.6	6.1	3.3	2.9
2	18.7	21.5	16.5	11.8	6.3	5.6
5	40.4	45.4	36.2	26.6	14.6	12.9
10	64.4	70.2	59.2	45.6	25.9	23.0
20	87.3	91.1	83.3	69.4	42.1	37.9
50	99.4	99.8	98.8	93.7	66.5	61.4
100	100.0	100.0	100.0	99.4	81.6	77.1
200	100.0	100.0	100.0	100.0	91.1	87.8
500	100.0	100.0	100.0	100.0	97.0	95.3