LPC 044

Lead-210 Methods for Lake Sediments and Peat

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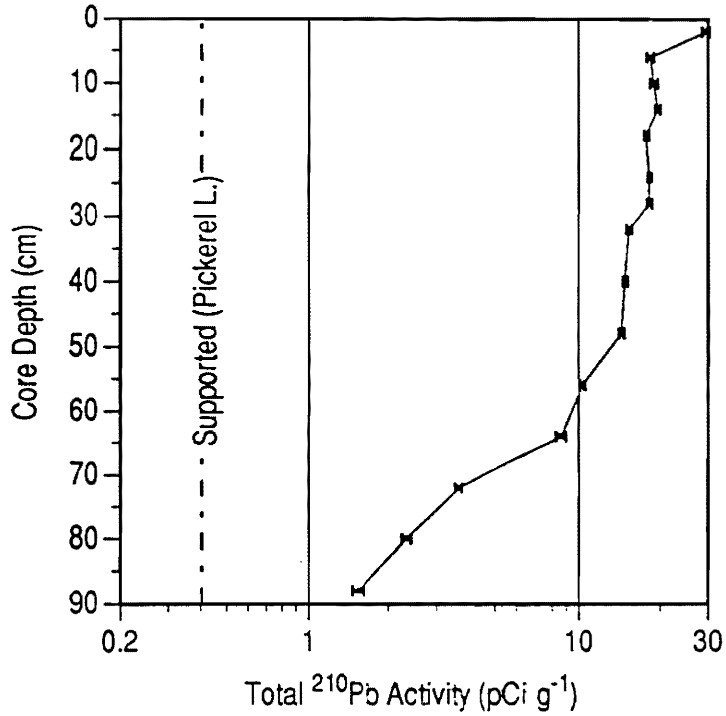
Cores of lake sediments or peat are analyzed for excess ^{210}Pb activity to determine age and sediment accumulation rates for the past 150-200 years. ^{210}Pb is measured at 15-16 depth intervals in each core through its grand-daughter product ^{210}Po with ^{208}Po added as an internal yield tracer. The polonium isotopes are distilled from 0.2-1.3 g dry sediment at 550 °C following pretreatment with concentrated HCl and plated directly (without HNO_3 oxidation) onto silver planchettes from a 0.5 N HCl solution (modified from Eakins and Morrison 1976). Activity is measured for 1-6 x 10^5 s with Si-depleted surface barrier detectors and an Ortec Adcam™ alpha spectroscopy system. Unsupported ^{210}Pb is calculated by subtracting supported activity from the total activity measured at each level; supported ^{210}Pb is estimated from the asymptotic activity at depth (the mean of the lowermost samples in a core). Dates and sedimentation rates are determined according to the C.R.S. (constant rate of supply) model (Appleby and Oldfield 1978) with confidence intervals calculated by first-order error analysis of counting uncertainty (Binford 1990).

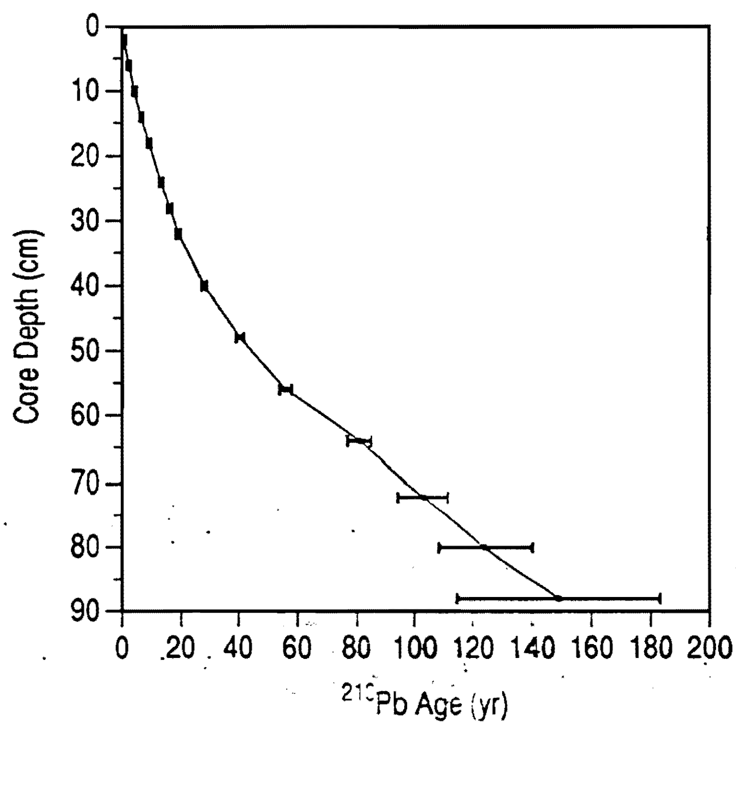
Appleby, P.G. and F. Oldfield. 1978. The calculation of lead-210 dates assuming a constant rate of supply of unsupported ^{210}Pb to the sediment. Catena **5**: 1-8.

Eakins, J.d. and R.T. Morrison. 1978. A new procedure for the determination of lead-210 in lake and marine sediments. International Journal of Applied Radiation and Isotopes **29**: 531-536.

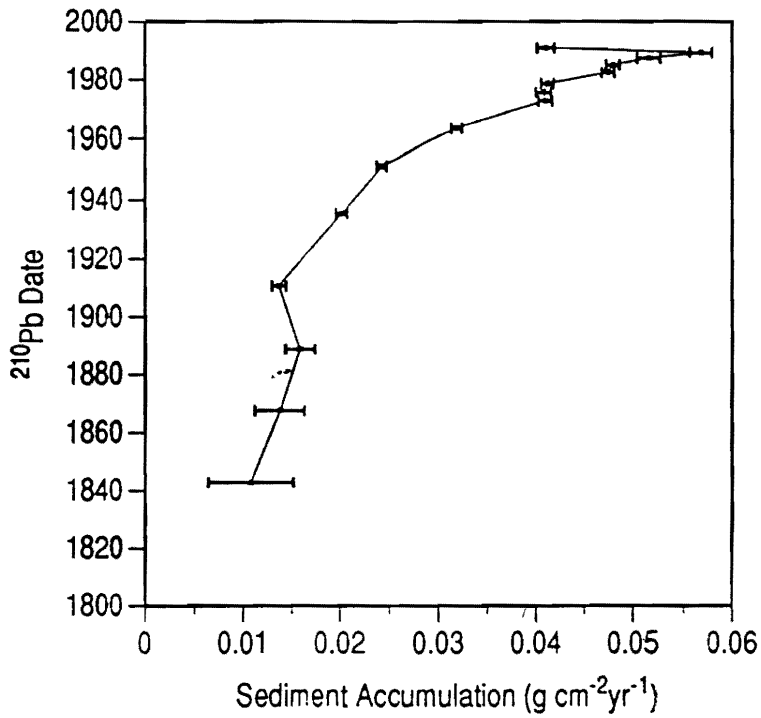
Binford, M. W., 1990. Calculation and uncertainty analysis of ^{210}Pb dates for PIRLA project lake sediment cores. J. Paleolimnology 3: 253-267.

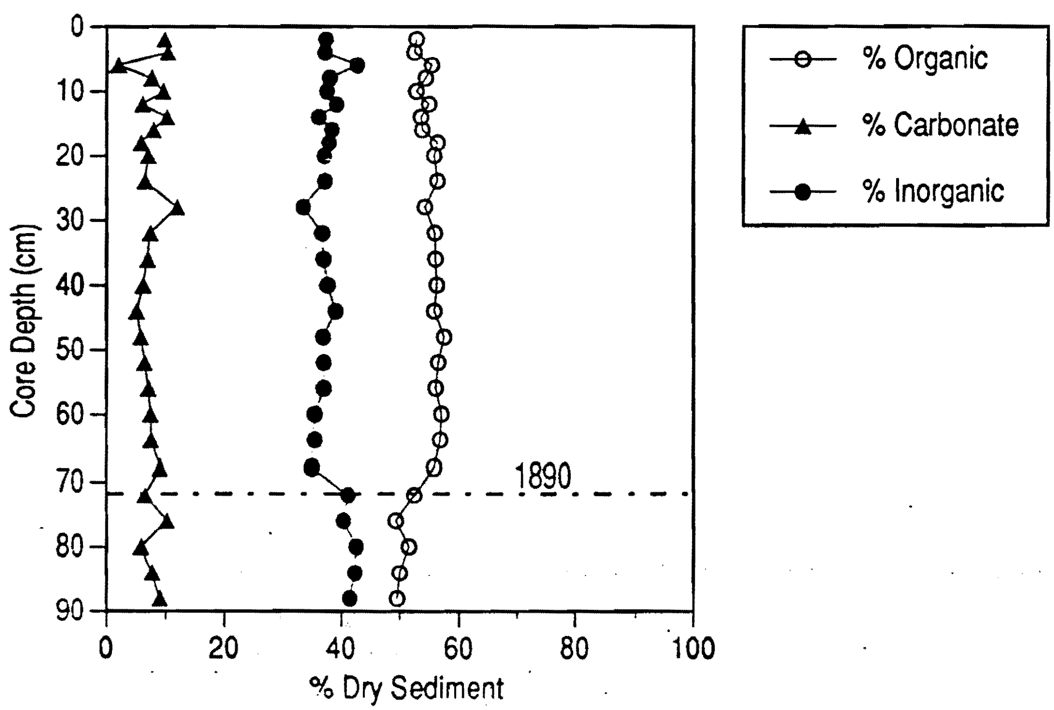
Crane Lake, Wisconsin



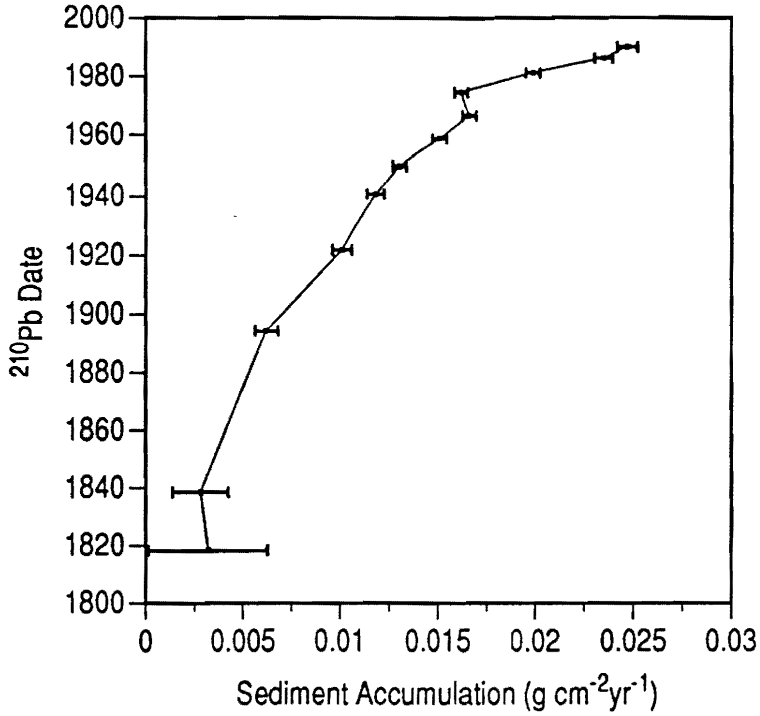


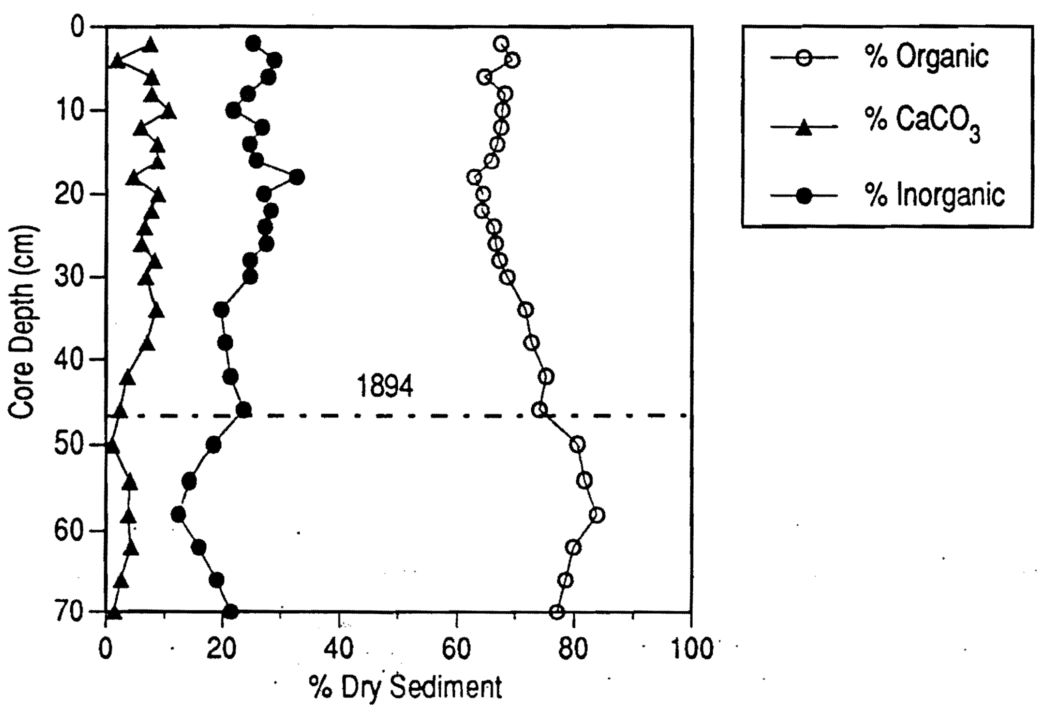
Crane Lake, Wisconsin



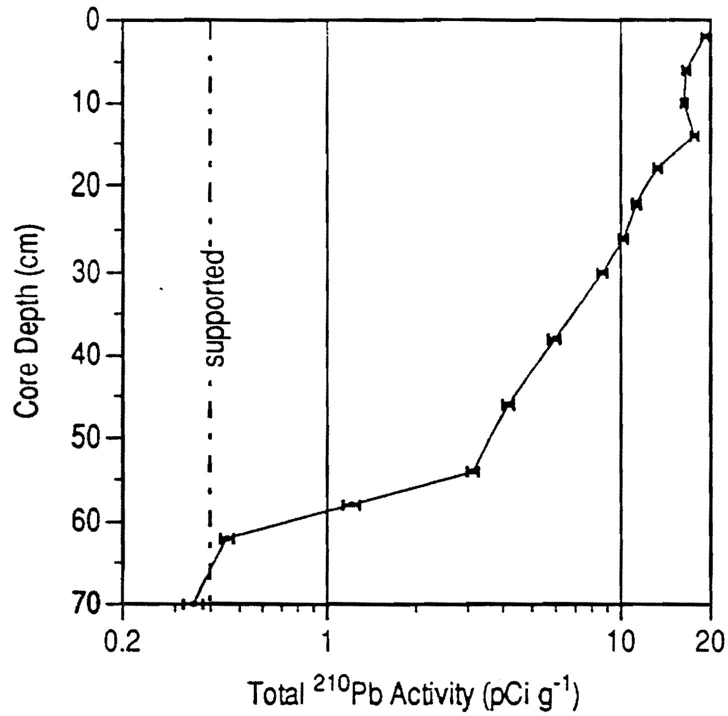


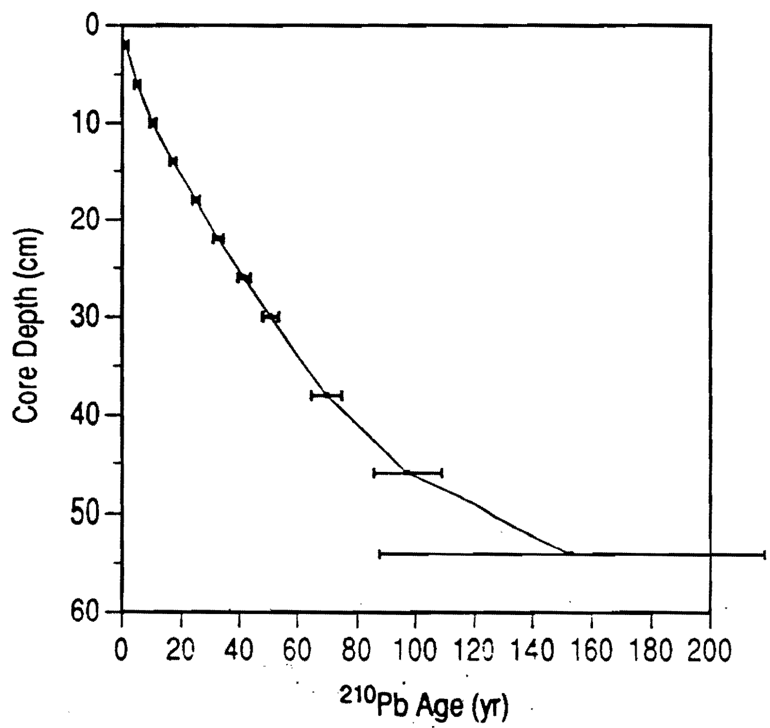
Pickerel Lake, Wisconsin





Pickerel Lake, Wisconsin





Pickerel Lake, Wisconsin: (East Basin) Coring Date: 7/17/1991

Top of Interval (cm)	Base of Interval (cm)	Cum. Dry Mass (g/cm2)	Unsup. Activity (pCi/g)	Error of Unsup. Act. (±s.d.)	Cum. Act. below Int. (pCi/cm2)	Age: Base of Int. (yr)	Error of Age (±s.d.)	Date A.D.	Sediment Accum. (g/cm2 yr)	Error of Sed. Accum. (±s.d.)
0	2	0.0308	18.7953	0.5935	13.7633	1.32	0.86	1990.2	0.0235	0.00050
4	6	0.1269	16.1731	0.5044	12.1557	5.31	0.92	1986.2	0.0235	0.00046
8	10	0.2384	15.8997	0.4208	10.3756	10.40	1.01	1981.1	0.0199	0.00036
12	14	0.3545	17.3371	0.5515	8.4049	17.16	1.16	1974.4	0.0162	0.00034
16	18	0.4888	12.8234	0.3919	6.5483	25.18	1.39	1966.4	0.0166	0.00035
20	22	0.6135	10.8552	0.3455	5.1334	32.99	1.70	1958.6	0.0151	0.00036
24	26	0.7352	9.7851	0.3329	3.9110	41.73	2.17	1949.8	0.0130	0.00035
28	30	0.8471	8.2551	0.3369	2.9449	50.84	2.82	1940.7	0.0118	0.00043
34	38	1.0597	5.5080	0.2753	1.6198	70.04	5.00	1921.5	0.0101	0.00050
42	46	1.2841	3.7496	0.1941	0.6901	97.43	11.58	1894.1	0.0062	0.00059
50	54	1.4757	2.7097	0.1565	0.1217	153.16	65.38	1838.4	0.0028	0.00143
54	58	1.5477	0.7919	0.0946	0.0647	173.45	122.93	1818.1	0.0032	0.00306

Supported Pb-210: 0.4093 ± 0.0551 pCi/g

Number of Supported Samples: 2

Cum. Unsup. Pb-210: 14.3422 pCi/cm2

Unsup. Pb-210 Flux: 0.4558 pCi/cm2 yr

Crane Lake, Wisconsin: Coring Date: 7/17/1991

Top of Interval (cm)	Base of Interval (cm)	Cum. Dry Mass (g/cm2)	Unsup. Activity (pCi/g)	Error of Unsup. Act. (±s.d.)	Cum. Act. below Int. (pCi/cm2)	Age: Base of Int. (yr)	Error of Age (±s.d.)	Date A.D.	Sediment Accum. (g/cm2 yr)	Error of Sed. Accum. (+s.d.)
0	2	0.0280	29.0380	0.9244	34.4807	0.75	0.53	1990.8	0.0410	0.00087
4	6	0.1119	17.9475	0.5660	32.7923	2.36	0.54	1989.2	0.0568	0.00117
8	10	0.2141	18.5317	0.6564	30.9237	4.24	0.56	1987.3	0.0516	0.00111
12	14	0.3277	19.1420	0.4321	28.7662	6.57	0.58	1985.0	0.0480	0.00072
16	18	0.4516	17.3113	0.3659	26.5671	9.12	0.61	1982.4	0.0475	0.00067
20	24	0.6252	17.7593	0.3185	23.5002	13.06	0.66	1978.5	0.0412	0.00066
24	28	0.7468	17.7886	0.4100	21.3371	16.16	0.70	1975.4	0.0408	0.00074
28	32	0.8720	14.8920	0.3559	19.4726	19.10	0.75	1972.4	0.0410	0.00069
36	40	1.2034	14.4108	0.2818	14.6605	28.21	0.93	1963.3	0.0319	0.00051
44	48	1.5342	13.9903	0.3040	9.9971	40.51	1.29	1951.0	0.0242	0.00048
52	56	1.8888	9.9527	0.2158	6.1495	56.11	2.02	1935.4	0.0202	0.00058
60	64	2.2724	8.2154	0.3653	2.8416	80.90	4.22	1910.6	0.0137	0.00076
68	72	2.6032	3.2030	0.1256	1.4370	102.80	8.28	1888.7	0.0159	0.00157
76	80	2.9192	1.9090	0.1056	0.7433	123.97	15.96	1867.6	0.0138	0.00259
84	88	3.2272	1.1159	0.0990	0.3443	148.68	34.40	1842.9	0.0108	0.00437

Supported Pb-210: 0.4093 ± 0.0551 pCi/g

Number of Supported Samples: 2

Cum. Unsup. Pb-210: 35.2938 pCi/cm2

Unsup. Pb-210 Flux: 1.1226 pCi/cm2 yr

Top	Base	Wet (g/cc)	Dry (g/cc)	Dry/Wet	Org/Wet	% Organic	% CaCO3	% Inorg.
0	2	0.9894	0.0140	0.0141	0.0075	52.86	9.75	37.40
2	4	1.0167	0.0221	0.0217	0.0114	52.49	10.29	37.22
4	6	1.0194	0.0233	0.0229	0.0127	55.36	1.95	42.68
6	8	1.0278	0.0272	0.0265	0.0144	54.41	7.52	38.06
8	10	1.0183	0.0263	0.0258	0.0137	52.85	9.51	37.64
10	12	1.0538	0.0306	0.0290	0.0159	54.90	5.95	39.15
12	14	1.0274	0.0291	0.0283	0.0152	53.61	10.16	36.23
14	16	1.0264	0.0318	0.0310	0.0167	53.77	7.87	38.36
16	18	1.0276	0.0316	0.0308	0.0173	56.33	5.76	37.91
18	20	1.0130	0.0324	0.0320	0.0179	55.86	7.02	37.12
20	24	1.0204	0.0284	0.0278	0.0157	56.34	6.41	37.26
24	28	1.0080	0.0304	0.0302	0.0164	54.28	11.97	33.76
28	32	1.0142	0.0313	0.0309	0.0173	55.91	7.27	36.82
32	36	1.0148	0.0364	0.0359	0.0201	56.04	6.87	37.08
36	40	1.0268	0.0448	0.0436	0.0245	56.25	6.09	37.66
40	44	1.0228	0.0451	0.0441	0.0246	55.88	5.04	39.08
44	48	1.0146	0.0402	0.0396	0.0228	57.46	5.66	36.88
48	52	1.0297	0.0428	0.0416	0.0235	56.54	6.38	37.08
52	56	1.0198	0.0457	0.0448	0.0251	56.02	6.97	37.02
56	60	1.0006	0.0433	0.0433	0.0247	57.04	7.35	35.60
60	64	1.0244	0.0487	0.0475	0.0270	56.88	7.47	35.65
64	68	0.9918	0.0378	0.0381	0.0213	55.82	9.02	35.16
68	72	1.0194	0.0389	0.0382	0.0200	52.44	6.43	41.13
72	76	0.9869	0.0377	0.0382	0.0188	49.34	10.25	40.41
76	80	1.0401	0.0397	0.0382	0.0197	51.64	5.73	42.63
80	84	0.9795	0.0358	0.0365	0.0183	50.00	7.62	42.38
84	88	1.0143	0.0381	0.0376	0.0186	49.61	8.95	41.44

Loss-On-Ignition

Pickerel L. (East Basin), WI: 7/17/91

Top	Base	Wet (g/cc)	Dry (g/cc)	Dry/Wet	Org/Wet	% Organic	%CaCO3	% Inorg.
0	2	1.0147	0.0154	0.0152	0.0102	67.53	7.38	25.08
2	4	1.0314	0.0245	0.0238	0.0165	69.39	1.86	28.76
4	6	1.0051	0.0269	0.0268	0.0173	64.68	7.61	27.71
6	8	1.0064	0.0239	0.0237	0.0162	68.20	7.61	24.19
8	10	1.0133	0.0282	0.0278	0.0188	67.73	10.48	21.79
10	12	1.0187	0.0274	0.0269	0.0182	67.52	5.81	26.67
12	14	1.0286	0.0293	0.0285	0.0191	66.89	8.54	24.57
14	16	1.0288	0.0319	0.0310	0.0204	65.83	8.55	25.62
16	18	1.0272	0.0350	0.0341	0.0214	62.86	4.55	32.59
18	20	1.0230	0.0368	0.0360	0.0232	64.40	8.65	26.95
20	22	1.0225	0.0299	0.0292	0.0188	64.21	7.61	28.18
22	24	1.0222	0.0282	0.0276	0.0183	66.31	6.45	27.24
24	26	1.0394	0.0306	0.0294	0.0196	66.67	5.95	27.39
26	28	1.0127	0.0281	0.0277	0.0187	67.26	8.09	24.65
28	30	1.0387	0.0271	0.0261	0.0179	68.63	6.71	24.65
30	34	1.0066	0.0269	0.0267	0.0192	71.75	8.45	19.80
34	38	1.0250	0.0264	0.0258	0.0187	72.73	6.89	20.38
38	42	1.0467	0.0258	0.0246	0.0185	75.19	3.53	21.28
42	46	1.0352	0.0286	0.0276	0.0205	74.13	2.39	23.49
46	50	1.0129	0.0226	0.0223	0.0180	80.53	1.01	18.46
50	54	1.0261	0.0224	0.0218	0.0178	81.70	4.06	14.24
54	58	1.0104	0.0180	0.0178	0.0149	83.89	3.79	12.32
58	62	1.0253	0.0268	0.0261	0.0209	79.85	4.24	15.91
62	66	1.0256	0.0265	0.0258	0.0203	78.49	2.57	18.94
66	70	1.0572	0.0319	0.0302	0.0233	77.12	1.43	21.46