[] Dendrochronology Program Library Run 82ELL Program COF 11:03 Fri 11 Mar 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27830

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: 82\_ELL\_Corr1-50

File of DATED series: 82\_ELL\_corr1

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 50 years lagged successively by 25 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .3281

6 Master dating series saved N

7 Ring measurements listed Y

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1824 to 2010 187 years

Continuous time span is 1824 to 2010 187 years

Portion with two or more series is 1825 to 2010 186 years

>> 221-a 2007 absent in 2 of 22 series, but is not usually narrow: master index is .248

>> 221-a 2008 absent in 2 of 22 series, but is not usually narrow: master index is .732

>> 221-a 2009 absent in 2 of 22 series, but is not usually narrow: master index is .750

>> 221-a 2010 absent in 2 of 22 series, but is not usually narrow: master index is 1.555

>> 221-b 2007 absent in 2 of 22 series, but is not usually narrow: master index is .248

>> 221-b 2008 absent in 2 of 22 series, but is not usually narrow: master index is .732

>> 221-b 2009 absent in 2 of 22 series, but is not usually narrow: master index is .750

>> 221-b 2010 absent in 2 of 22 series, but is not usually narrow: master index is 1.555

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 22 \*C\*

\*O\* Master series 1824 2010 187 yrs \*O\*

\*F\* Total rings in all series 2165 \*F\*

\*E\* Total dated rings checked 2164 \*E\*

\*C\* Series intercorrelation .602 \*C\*

\*H\* Average mean sensitivity .242 \*H\*

\*A\* Segments, possible problems 2 \*A\*

\*\*\* Mean length of series 98.4 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

215-b 1 absent rings: 2004

216-a 1 absent rings: 2004

216-b 2 absent rings: 2003 2004

219-b 1 absent rings: 2004

221-a 8 absent rings: 2003 2004 2005 2006 2007 2008 2009 2010

221-b 6 absent rings: 2005 2006 2007 2008 2009 2010

19 absent rings .878%

PART 2: TIME PLOT OF TREE-RING SERIES: 82\_ELL\_Corr1-50 11:03 Fri 11 Mar 2011 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . <===============> . 211-a 1 1853 2010 158

. . . . . . . . . . . . . . . . <==================> . 211-b 2 1825 2010 186

. . . . . . . . . . . . . . . . . . <======> . 212-a 3 1943 2010 68

. . . . . . . . . . . . . . . . . . <=======> . 212-b 4 1939 2010 72

. . . . . . . . . . . . . . . . . . <========> . 213-a 5 1920 2010 91

. . . . . . . . . . . . . . . . . . <========> . 213-b 6 1925 2010 86

. . . . . . . . . . . . . . . . . . <======> . 214-a 7 1949 2010 62

. . . . . . . . . . . . . . . . . . <======> . 214-b 8 1941 2010 70

. . . . . . . . . . . . . . . . . . <======> . 215-a 9 1948 2010 63

. . . . . . . . . . . . . . . . . . <======> . 215-b 10 1944 2010 67

. . . . . . . . . . . . . . . . . <===========> . 216-a 11 1895 2010 116

. . . . . . . . . . . . . . . . . <===========> . 216-b 12 1894 2010 117

. . . . . . . . . . . . . . . . . .<=========> . 217-a 13 1918 2010 93

. . . . . . . . . . . . . . . . . . <========> . 217-b 14 1924 2010 87

. . . . . . . . . . . . . . . . . . <=======> . 218-a 15 1930 2010 81

. . . . . . . . . . . . . . . . . . <======> . 218-b 16 1942 2010 69

. . . . . . . . . . . . . . . . . . <=======> . 219-a 17 1936 2010 75

. . . . . . . . . . . . . . . . . . <========> . 219-b 18 1923 2010 88

. . . . . . . . . . . . . . . . . . <=======> . 220-a 19 1930 2010 81

. . . . . . . . . . . . . . . . . . <========> . 220-b 20 1921 2010 90

. . . . . . . . . . . . . . . . <==================> . 221-a 21 1824 2010 187

. . . . . . . . . . . . . . . . <===============> . 221-b 22 1853 2010 158

: : : : : : : : : : : : : : : : : : : : :

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: 82\_ELL\_Corr1-50 11:03 Fri 11 Mar 2011 Page 3

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1850 -.504 2 1900 -.451 6 1950 -.664 22 2000 .140 22

1851 .364 2 1901 -2.065 6 1951 -.067 22 2001 1.290 22

1852 -.202 2 1902 -.833 6 1952 -.182 22 2002 1.055 22

1853 .305 4 1903 .508 6 1953 -1.019 22 2003 -1.929 22 2

1854 .602 4 1904 1.857 6 1954 .175 22 2004 -2.127 22 5

1855 1.234 4 1905 .600 6 1955 1.308 22 2005 -1.640 22 2

1856 1.972 4 1906 1.099 6 1956 -1.156 22 2006 -1.147 22 2

1857 1.014 4 1907 .300 6 1957 .595 22 2007 .248 22 2<<

1858 .596 4 1908 .932 6 1958 1.040 22 2008 .732 22 2<<

1859 .436 4 1909 -.914 6 1959 .756 22 2009 .750 22 2<<

1860 -.278 4 1910 -1.187 6 1960 .235 22 2010 1.555 22 2<<

1861 .314 4 1911 -2.212 6 1961 1.790 22

1862 .489 4 1912 -.785 6 1962 -.202 22

1863 -.410 4 1913 .742 6 1963 .217 22

1864 -.880 4 1914 .562 6 1964 .363 22

1865 -.966 4 1915 .287 6 1965 .088 22

1866 -1.803 4 1916 .856 6 1966 -1.108 22

1867 -1.019 4 1917 -.449 6 1967 .089 22

1868 -1.640 4 1918 -1.033 7 1968 -.387 22

1869 -1.726 4 1919 .187 7 1969 -.119 22

1870 .432 4 1920 -2.423 8 1970 .711 22

1871 1.101 4 1921 -.484 9 1971 1.283 22

1872 1.230 4 1922 -.197 9 1972 -.569 22

1873 -.033 4 1923 .194 10 1973 -.992 22

1824 .704 1 1874 .822 4 1924 1.866 11 1974 -.783 22

1825 1.113 2 1875 1.780 4 1925 .575 12 1975 1.149 22

1826 .963 2 1876 -1.025 4 1926 .010 12 1976 -.201 22

1827 .039 2 1877 -1.513 4 1927 -.168 12 1977 -.233 22

1828 -2.771 2 1878 -1.349 4 1928 .335 12 1978 .581 22

1829 .075 2 1879 .359 4 1929 .019 12 1979 .944 22

1830 1.010 2 1880 1.096 4 1930 .404 14 1980 1.196 22

1831 .458 2 1881 -.532 4 1931 1.593 14 1981 -2.780 22

1832 .969 2 1882 -.460 4 1932 .781 14 1982 -1.769 22

1833 1.897 2 1883 -.541 4 1933 -.014 14 1983 -.869 22

1834 .549 2 1884 -.219 4 1934 -.077 14 1984 -.314 22

1835 -2.053 2 1885 .273 4 1935 -1.864 14 1985 -.394 22

1836 .230 2 1886 2.290 4 1936 -.429 15 1986 -1.693 22

1837 -.160 2 1887 .796 4 1937 .284 15 1987 .588 22

1838 -2.212 2 1888 .564 4 1938 .428 15 1988 .817 22

1839 -1.516 2 1889 -.251 4 1939 .677 16 1989 -.111 22

1840 .736 2 1890 .754 4 1940 -1.095 16 1990 .042 22

1841 -.126 2 1891 -.055 4 1941 1.289 17 1991 .532 22

1842 -1.361 2 1892 1.171 4 1942 .068 18 1992 .671 22

1843 -.462 2 1893 -.421 4 1943 -.286 19 1993 1.361 22

1844 -2.100 2 1894 -.210 5 1944 -.225 20 1994 .684 22

1845 .276 2 1895 .254 6 1945 -.939 20 1995 1.148 22

1846 .964 2 1896 -.310 6 1946 -.365 20 1996 -.785 22

1847 -.662 2 1897 -.133 6 1947 .761 20 1997 .255 22

1848 .501 2 1898 .909 6 1948 -1.450 21 1998 -.549 22

1849 -.290 2 1899 -.178 6 1949 .163 22 1999 .698 22

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PART 4: Master Bar Plot: 82\_ELL\_Corr1-50 11:03 Fri 11 Mar 2011 Page 4

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1850--b 1900---b 1950--c 2000-----A

1851------A 1901h 1951----@ 2001---------E

1852----a 1902--c 1952----a 2002---------D

1853------A 1903-------B 1953-d 2003h

1854-------B 1904----------G 1954-----A 2004i

1855---------E 1905-------B 1955----------E 2005g

1856----------H 1906---------D 1956-e 2006-e

1857---------D 1907------A 1957-------B 2007------A

1858-------B 1908---------D 1958---------D 2008--------C

1859-------B 1909-d 1959--------C 2009--------C

1860---a 1910-e 1960------A 2010----------F

1861------A 1911i 1961----------G

1862-------B 1912--c 1962----a

1863---b 1913--------C 1963------A

1864--d 1914-------B 1964------A

1865-d 1915------A 1965-----@

1866g 1916--------C 1966-d

1867-d 1917---b 1967-----@

1868g 1918-d 1968---b

1869g 1919-----A 1969----@

1870------B 1920j 1970--------C

1871---------D 1921---b 1971---------E

1872---------E 1922----a 1972--b

1873-----@ 1923-----A 1973-d

1824--------C 1874--------C 1924----------G 1974--c

1825---------D 1875----------G 1925-------B 1975---------E

1826---------D 1876-d 1926-----@ 1976----a

1827-----@ 1877-f 1927----a 1977----a

1828k 1878-e 1928------A 1978-------B

1829-----@ 1879------A 1929-----@ 1979---------D

1830---------D 1880---------D 1930------B 1980---------E

1831-------B 1881--b 1931----------F 1981k

1832---------D 1882---b 1932--------C 1982g

1833----------H 1883--b 1933-----@ 1983--c

1834-------B 1884----a 1934----@ 1984---a

1835h 1885------A 1935g 1985---b

1836------A 1886----------I 1936---b 1986g

1837----a 1887--------C 1937------A 1987-------B

1838i 1888-------B 1938------B 1988--------C

1839-f 1889---a 1939--------C 1989----@

1840--------C 1890--------C 1940-d 1990-----@

1841----a 1891----@ 1941---------E 1991-------B

1842-e 1892---------E 1942-----@ 1992--------C

1843---b 1893---b 1943---a 1993----------E

1844h 1894----a 1944----a 1994--------C

1845------A 1895------A 1945-d 1995---------E

1846---------D 1896---a 1946---a 1996--c

1847--c 1897----a 1947--------C 1997------A

1848-------B 1898---------D 1948-f 1998--b

1849---a 1899----a 1949-----A 1999--------C

PART 5: CORRELATION OF SERIES BY SEGMENTS: 82\_ELL\_Corr1-50 11:03 Fri 11 Mar 2011 Page 5

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Correlations of 50-year dated segments, lagged 25 years

Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1825 1850 1875 1900 1925 1950 1975

1874 1899 1924 1949 1974 1999 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 211-a 1853 2010 .38 .44 .64 .69 .81 .84

2 211-b 1825 2010 .28B .36 .53 .76 .66 .75 .80

3 212-a 1943 2010 .45 .51 .62

4 212-b 1939 2010 .60 .64 .71

5 213-a 1920 2010 .67 .54 .53 .56

6 213-b 1925 2010 .66 .58 .68

7 214-a 1949 2010 .66 .70 .76

8 214-b 1941 2010 .44 .46 .58

9 215-a 1948 2010 .57 .57 .68

10 215-b 1944 2010 .48 .53 .75

11 216-a 1895 2010 .54 .62 .65 .62 .69

12 216-b 1894 2010 .42 .59 .54 .68 .78

13 217-a 1918 2010 .54 .51 .82 .81

14 217-b 1924 2010 .42 .40 .75 .79

15 218-a 1930 2010 .49 .52 .53

16 218-b 1942 2010 .63 .67 .72

17 219-a 1936 2010 .56 .58 .66

18 219-b 1923 2010 .41 .53 .58 .59

19 220-a 1930 2010 .57 .83 .76

20 220-b 1921 2010 .36 .38 .81 .81

21 221-a 1824 2010 .28A .46 .53 .63 .62 .62 .57

22 221-b 1853 2010 .54 .73 .60 .52 .73 .64

Av segment correlation .28 .43 .53 .57 .55 .65 .70

PART 6: POTENTIAL PROBLEMS: 82\_ELL\_Corr1-50 11:03 Fri 11 Mar 2011 Page 5

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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211-a 1853 to 2010 158 years Series 1

[B] Entire series, effect on correlation ( .666) is:

Lower 1896> -.019 1879< -.017 1925< -.010 1853< -.009 1986< -.008 1901> -.008 Higher 1981 .049 1956 .012

211-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1853 78 86 104 113 90 80 61

1860 50 50 40 28 20 19 13 15 14 7

1870 12 17 27 11 14 14 10 6 10 9

1880 17 20 20 22 29 37 62 37 36 36

1890 37 35 48 43 57 77 105 96 112 43

1900 35 42 35 51 95 68 78 96 96 75

1910 67 55 66 98 97 104 99 68 79 143

1920 95 137 144 155 185 105 124 142 150 146

1930 210 236 227 199 263 118 159 248 199 231

1940 115 215 152 117 125 130 145 231 170 228

1950 171 218 234 182 230 279 143 167 179 186

1960 161 239 153 217 247 189 197 236 247 241

1970 343 375 241 239 202 263 140 156 188 228

1980 206 79 111 136 159 156 70 151 183 140

1990 153 161 190 209 181 175 98 134 101 188

2000 183 263 252 64 31 48 100 149 156 161

2010 212

====================================================================================================================================

211-b 1825 to 2010 186 years Series 2

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1825 1874 3 - - - - - - - - - -.06 .28| .08 -.01 .30\* .10 .02 -.07 .09 -.03 -.09 -.01

[B] Entire series, effect on correlation ( .565) is:

Lower 1835< -.027 1826< -.014 1830< -.014 1896> -.009 1849> -.009 1899< -.008 Higher 1981 .049 1920 .012

1825 to 1874 segment:

Lower 1835< -.082 1826< -.039 1830< -.035 1849> -.023 1848> -.020 1862< -.016 Higher 1828 .047 1844 .027

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1835 -4.7 SD; 1849 +3.2 SD

211-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1825 44 36 40 32 56

1830 43 49 69 96 56 19 48 50 45 51

1840 91 74 62 65 53 68 86 64 109 104

1850 96 97 76 86 86 97 104 104 107 78

1860 60 47 34 29 26 49 15 22 17 26

1870 44 69 62 46 52 58 47 47 53 87

1880 97 59 52 57 65 69 105 105 82 76

1890 76 73 97 109 102 126 146 147 126 39

1900 25 45 106 121 187 105 161 100 127 95

1910 81 57 81 117 110 109 114 91 118 125

1920 79 112 97 126 181 126 123 100 93 84

1930 88 118 121 96 86 49 55 91 84 104

1940 77 172 127 99 83 72 83 119 72 101

1950 94 98 119 114 141 133 106 140 153 161

1960 149 186 165 174 206 203 213 270 234 214

1970 263 251 230 261 218 225 134 205 211 186

1980 197 61 84 98 105 114 75 133 137 118

1990 152 149 135 151 140 141 111 143 154 197

2000 186 201 186 54 24 38 66 128 149 158

2010 216

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212-a 1943 to 2010 68 years Series 3

[B] Entire series, effect on correlation ( .546) is:

Lower 1966< -.081 1954< -.044 1945> -.020 1980< -.015 1974> -.012 1946< -.009 Higher 1981 .038 2003 .031

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1966 -6.0 SD

212-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 206 319 353 176 286 182 177

1950 172 203 197 190 141 239 199 229 219 209

1960 214 259 196 212 235 205 125 206 187 225

1970 244 292 216 223 282 236 189 211 252 217

1980 150 91 112 93 116 125 131 162 154 156

1990 135 152 128 141 134 168 92 109 109 150

2000 109 178 143 35 28 36 56 109 148 233

2010 263

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212-b 1939 to 2010 72 years Series 4

[B] Entire series, effect on correlation ( .629) is:

Lower 1954< -.017 1948> -.016 1980< -.015 1988< -.014 1958< -.013 1986> -.013 Higher 1981 .135 1956 .014

[C] Year-to-year changes diverging by over 4.0 std deviations:

1981 1982 4.4 SD

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1981 -6.2 SD

212-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 213

1940 186 260 273 340 316 204 271 299 252 310

1950 221 251 283 234 200 265 200 228 218 216

1960 274 266 242 257 285 285 219 242 240 238

1970 295 256 211 216 241 270 247 217 203 220

1980 181 98 195 178 219 192 183 200 146 124

1990 140 162 180 164 168 171 142 169 131 166

2000 104 176 153 34 26 41 52 84 140 171

2010 239

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213-a 1920 to 2010 91 years Series 5

[B] Entire series, effect on correlation ( .606) is:

Lower 1971< -.062 1981> -.031 1962< -.012 1942< -.008 1929< -.007 1926< -.007 Higher 1920 .015 2003 .014

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1981 +3.0 SD

213-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 45 59 76 93 97 83 69 96 119 90

1930 95 129 124 112 102 83 162 189 217 231

1940 151 230 132 152 189 119 160 191 148 213

1950 146 181 190 168 203 280 198 269 295 230

1960 220 265 129 156 143 122 98 128 143 121

1970 121 69 78 65 91 103 72 69 100 127

1980 147 87 73 61 58 54 41 83 123 84

1990 83 107 132 160 140 173 112 127 120 139

2000 85 105 76 24 15 17 15 27 25 15

2010 32

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213-b 1925 to 2010 86 years Series 6

[B] Entire series, effect on correlation ( .644) is:

Lower 1981> -.065 1940> -.020 1956> -.016 1934< -.012 1944> -.008 1976> -.008 Higher 2003 .035 1948 .022

213-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 136 122 119 117 134

1930 127 160 130 118 84 60 89 112 146 130

1940 123 180 105 102 160 110 121 111 62 103

1950 71 106 147 130 138 187 134 161 167 136

1960 127 166 93 114 104 105 90 132 88 92

1970 99 88 58 61 59 100 86 69 80 73

1980 96 61 43 56 53 43 43 63 81 40

1990 32 46 40 61 59 67 32 60 52 89

2000 66 75 77 9 19 18 21 32 46 52

2010 61

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214-a 1949 to 2010 62 years Series 7

[B] Entire series, effect on correlation ( .705) is:

Lower 1970< -.035 1949< -.033 1997< -.020 1950> -.018 1976> -.017 1987< -.010 Higher 1981 .094 2003 .042

214-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1949 194

1950 244 256 229 183 215 233 197 278 267 237

1960 214 247 199 237 210 190 162 172 162 178

1970 134 144 118 109 107 160 153 138 161 126

1980 125 79 109 112 110 117 104 105 134 116

1990 98 163 196 212 189 218 116 106 119 197

2000 225 279 250 153 221 264 271 343 353 415

2010 467

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214-b 1941 to 2010 70 years Series 8

[B] Entire series, effect on correlation ( .507) is:

Lower 1968< -.039 1941< -.035 1955< -.029 1996> -.019 1950> -.011 1966> -.009 Higher 2003 .076 1981 .022

214-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 130 138 153 158 148 184 185 162 213

1950 217 238 238 181 250 176 158 181 202 202

1960 188 216 163 184 192 183 164 162 110 134

1970 128 140 118 116 120 124 93 96 124 136

1980 152 94 114 111 97 118 104 126 170 113

1990 130 174 183 241 252 293 269 280 291 292

2000 284 335 294 154 260 293 211 343 344 382

2010 355

====================================================================================================================================

215-a 1948 to 2010 63 years Series 9

[B] Entire series, effect on correlation ( .634) is:

Lower 1952< -.026 1994< -.021 1972< -.017 1956> -.016 1984< -.012 1974< -.010 Higher 1981 .046 2003 .031

215-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1948 125 173

1950 168 171 125 123 180 223 230 342 353 384

1960 378 389 321 304 296 271 245 226 177 177

1970 213 259 165 162 132 199 175 180 206 218

1980 183 110 95 140 119 107 111 174 147 111

1990 111 108 138 156 100 98 89 87 89 124

2000 117 151 125 43 20 31 35 83 95 105

2010 178

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215-b 1944 to 2010 67 years Series 10

[B] Entire series, effect on correlation ( .556) is:

Lower 1952< -.074 1956> -.038 1945> -.016 1959< -.010 1955< -.010 1948> -.007 Higher 1981 .058 2003 .029

[D] 1 Absent rings: Year Master N series Absent

2004 -2.127 22 5

215-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 96 148 183 181 152 216

1950 185 170 109 111 172 182 218 219 264 219

1960 252 354 287 272 258 282 217 233 260 268

1970 285 281 244 181 209 278 214 203 206 206

1980 178 110 123 103 91 75 61 84 99 99

1990 76 81 89 114 72 117 79 86 63 73

2000 71 65 59 18 0 12 14 29 34 33

2010 71

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216-a 1895 to 2010 116 years Series 11

[B] Entire series, effect on correlation ( .637) is:

Lower 1917> -.015 1966> -.014 1981> -.012 1907< -.012 1968> -.009 1896< -.007 Higher 1920 .020 1948 .015

[D] 1 Absent rings: Year Master N series Absent

2004 -2.127 22 5

216-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1895 166 86 96 140 126

1900 130 92 102 121 130 106 103 69 82 60

1910 59 59 78 97 65 64 68 77 62 56

1920 35 43 52 69 81 67 53 46 60 75

1930 97 124 75 70 114 28 53 38 34 49

1940 57 120 112 105 136 87 96 158 58 103

1950 75 121 117 146 147 246 121 140 167 154

1960 147 219 195 216 191 179 211 204 234 201

1970 216 220 138 109 100 133 118 74 98 115

1980 173 80 45 44 50 46 41 61 57 52

1990 60 64 81 107 75 94 45 77 56 94

2000 102 185 174 35 0 5 26 52 88 108

2010 159

====================================================================================================================================

216-b 1894 to 2010 117 years Series 12

[B] Entire series, effect on correlation ( .609) is:

Lower 1896< -.049 1956> -.017 1939< -.015 1901> -.014 1940> -.013 1911> -.011 Higher 2003 .028 1981 .024

[D] 2 Absent rings: Year Master N series Absent

2003 -1.929 22 2

2004 -2.127 22 5

216-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 131 146 74 104 195 190

1900 152 125 121 150 161 129 127 106 108 71

1910 74 80 99 110 93 78 81 63 33 32

1920 23 38 47 60 67 49 35 30 28 35

1930 41 50 54 41 39 13 17 31 62 49

1940 62 95 80 83 105 91 98 165 103 142

1950 157 130 197 234 276 301 257 307 369 244

1960 199 270 181 158 143 131 127 154 144 158

1970 197 224 195 149 138 175 151 144 139 164

1980 165 98 73 75 105 86 63 94 77 75

1990 73 69 67 96 81 103 49 87 55 92

2000 78 100 73 0 0 26 18 26 28 32

2010 70

====================================================================================================================================

217-a 1918 to 2010 93 years Series 13

[B] Entire series, effect on correlation ( .685) is:

Lower 1940> -.048 1932< -.013 1926< -.012 1918> -.011 1948> -.010 1941< -.008 Higher 1981 .060 1920 .021

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1940 +3.2 SD

217-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 26 25

1920 16 32 32 37 70 47 18 25 32 28

1930 28 146 52 52 41 21 77 66 79 122

1940 167 110 42 24 26 30 47 148 126 156

1950 169 227 205 175 309 389 291 345 365 393

1960 345 402 288 294 335 384 342 354 374 392

1970 376 407 288 252 258 334 287 267 282 290

1980 275 181 165 215 192 182 166 239 290 234

1990 247 244 258 283 215 258 192 205 171 201

2000 133 171 117 68 45 46 62 98 168 194

2010 247

====================================================================================================================================

217-b 1924 to 2010 87 years Series 14

[B] Entire series, effect on correlation ( .638) is:

Lower 1940> -.059 1932< -.021 1948> -.020 1976< -.018 1956> -.014 1962> -.010 Higher 1981 .075 2003 .018

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1940 +3.1 SD

217-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 45 44 16 17 22 19

1930 21 165 64 25 24 7 24 20 35 68

1940 144 156 92 44 41 43 49 63 88 109

1950 95 152 115 124 235 257 248 348 408 384

1960 407 430 393 433 384 403 335 335 294 272

1970 308 282 203 178 164 237 160 157 190 190

1980 205 127 132 130 135 139 120 197 213 169

1990 156 157 152 132 104 124 71 86 58 87

2000 79 108 93 44 18 27 61 120 228 244

2010 242

====================================================================================================================================

218-a 1930 to 2010 81 years Series 15

[B] Entire series, effect on correlation ( .533) is:

Lower 1975< -.046 1972> -.023 1937< -.014 1968> -.008 1995< -.008 1945> -.007 Higher 1948 .024 1981 .021

218-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1930 107 86 115 55 60 55 90 44 55 81

1940 88 216 186 249 227 243 211 261 176 255

1950 231 330 280 255 286 407 214 264 262 284

1960 236 284 195 204 206 195 148 235 251 222

1970 249 303 265 216 172 108 102 119 117 117

1980 131 71 69 72 87 99 75 109 109 99

1990 129 143 91 91 66 57 40 43 33 39

2000 37 53 45 26 22 32 42 81 83 68

2010 70

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218-b 1942 to 2010 69 years Series 16

[B] Entire series, effect on correlation ( .682) is:

Lower 1986> -.025 1985> -.017 1942> -.016 1948< -.015 1988< -.010 1953> -.007 Higher 2003 .030 1972 .010

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1985 +3.1 SD; 1986 +3.6 SD

218-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 212 191 181 179 212 218 113 149

1950 131 150 191 206 251 277 198 236 255 243

1960 221 256 183 196 217 180 177 192 188 175

1970 170 212 138 122 109 152 110 121 170 154

1980 166 87 97 113 176 229 191 196 123 96

1990 92 99 102 98 110 116 72 106 67 78

2000 95 109 98 38 34 53 50 105 127 124

2010 124

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219-a 1936 to 2010 75 years Series 17

[B] Entire series, effect on correlation ( .651) is:

Lower 1969< -.031 1963< -.029 1977< -.024 1950> -.012 1978< -.012 1945> -.011 Higher 1981 .040 2003 .039

219-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 238 295 335 357

1940 239 278 227 211 251 304 281 310 276 349

1950 366 363 379 293 353 397 299 410 428 352

1960 330 349 273 191 234 239 192 212 144 112

1970 169 262 173 185 200 234 192 121 125 233

1980 266 148 135 203 250 228 171 265 218 194

1990 207 183 193 191 147 168 110 99 95 117

2000 115 134 170 43 19 27 26 66 126 178

2010 269

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219-b 1923 to 2010 88 years Series 18

[B] Entire series, effect on correlation ( .457) is:

Lower 1923< -.074 1935> -.032 1978< -.022 1933< -.013 1989> -.007 1945> -.007 Higher 2003 .033 1956 .016

[D] 1 Absent rings: Year Master N series Absent

2004 -2.127 22 5

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1923 -5.3 SD

219-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 24 106 159 158 144 174 180

1930 226 265 248 141 185 226 280 236 215 240

1940 121 198 205 169 199 205 211 246 161 183

1950 137 131 120 103 132 147 102 142 197 216

1960 185 217 167 119 146 153 118 122 150 194

1970 227 288 179 139 162 214 172 137 78 94

1980 106 69 61 122 133 127 100 92 130 134

1990 115 103 91 96 83 93 63 71 46 43

2000 32 40 62 16 0 12 50 65 63 63

2010 94

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220-a 1930 to 2010 81 years Series 19

[B] Entire series, effect on correlation ( .673) is:

Lower 1935> -.047 2009< -.029 1931< -.020 2003> -.014 1944< -.009 1950> -.009 Higher 1981 .098 1956 .018

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1935 +3.1 SD

220-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1930 141 134 123 144 187 249 244 289 322 297

1940 196 279 211 177 84 63 88 166 113 196

1950 265 280 282 240 291 361 220 367 408 420

1960 379 438 388 461 448 375 285 342 286 295

1970 313 328 207 181 155 273 233 211 175 172

1980 152 68 103 109 106 96 59 77 97 103

1990 87 73 71 95 96 117 49 62 43 55

2000 54 63 72 49 36 42 46 61 84 38

2010 66

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220-b 1921 to 2010 90 years Series 20

[B] Entire series, effect on correlation ( .630) is:

Lower 1935> -.045 1944< -.044 1925< -.018 1967< -.015 1962> -.010 1932< -.010 Higher 1981 .097 1996 .011

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1935 +3.2 SD

220-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 145 147 151 246 154 227 206 271 239

1930 228 235 168 184 225 264 252 221 314 260

1940 210 330 214 211 95 105 159 197 168 185

1950 143 156 212 194 269 351 227 354 386 384

1960 374 426 382 438 398 385 300 226 256 284

1970 308 352 240 182 205 279 217 200 241 243

1980 247 126 148 140 171 175 156 203 156 173

1990 201 180 152 165 133 139 72 86 57 94

2000 72 114 101 51 31 49 85 149 163 147

2010 218

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221-a 1824 to 2010 187 years Series 21

[\*] Early part of series cannot be checked from 1824 to 1824 -- not matched by another series

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1825 1874 0 - - - - - - - - - .01 .28\*-.03 -.07 .23 -.13 -.30 -.03 .08 -.13 -.14 -.03

[B] Entire series, effect on correlation ( .512) is:

Lower 1835> -.044 1826> -.012 1830> -.010 1848< -.009 1849< -.007 1834> -.005 Higher 2003 .028 1935 .011

1825 to 1874 segment:

Lower 1835> -.092 1826> -.038 1830> -.034 1849< -.024 1848< -.024 1834> -.013 Higher 1828 .054 1844 .030

[D] 8 Absent rings: Year Master N series Absent

2003 -1.929 22 2

2004 -2.127 22 5

2005 -1.640 22 2

2006 -1.147 22 2

2007 .248 22 2 >> WARNING: Ring is not usually narrow

2008 .732 22 2 >> WARNING: Ring is not usually narrow

2009 .750 22 2 >> WARNING: Ring is not usually narrow

2010 1.555 22 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1835 +4.7 SD

221-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1824 136 138 158 113 71 89

1830 132 102 93 97 92 86 93 80 44 51

1840 73 68 54 79 58 123 135 112 108 94

1850 102 144 155 206 228 228 255 212 225 258

1860 248 261 232 186 143 140 145 161 132 153

1870 216 243 195 166 203 280 128 144 123 180

1880 182 130 149 146 122 125 176 148 166 146

1890 208 154 180 105 112 96 115 93 90 102

1900 100 54 69 87 110 76 75 77 79 66

1910 60 33 37 51 71 75 104 81 51 63

1920 63 69 68 97 147 117 118 100 110 96

1930 102 110 110 110 97 74 93 125 93 105

1940 66 109 88 83 99 82 86 103 72 86

1950 74 61 49 45 61 105 49 58 65 67

1960 55 109 86 51 42 40 32 53 47 59

1970 91 97 81 111 145 180 152 179 146 118

1980 120 50 52 63 73 57 46 68 52 43

1990 40 46 47 62 57 33 23 27 24 27

2000 13 24 34 0 0 0 0 0 0 0

2010 0

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221-b 1853 to 2010 158 years Series 22

[B] Entire series, effect on correlation ( .591) is:

Lower 2004> -.017 2003> -.017 1962> -.014 1858< -.011 1864> -.010 1940< -.010 Higher 1981 .047 1956 .015

[D] 6 Absent rings: Year Master N series Absent

2005 -1.640 22 2

2006 -1.147 22 2

2007 .248 22 2 >> WARNING: Ring is not usually narrow

2008 .732 22 2 >> WARNING: Ring is not usually narrow

2009 .750 22 2 >> WARNING: Ring is not usually narrow

2010 1.555 22 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

2004 +4.2 SD

221-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1853 307 290 290 311 260 212 214

1860 180 213 283 236 236 157 159 166 137 123

1870 182 152 152 158 178 234 114 107 108 171

1880 174 131 147 134 156 174 201 154 149 119

1890 140 123 136 96 85 77 82 74 73 63

1900 64 34 42 52 61 63 65 60 60 35

1910 30 26 32 38 49 37 46 36 27 69

1920 39 45 51 63 82 81 87 82 87 76

1930 74 94 94 87 70 56 58 74 59 66

1940 31 72 63 63 59 35 47 52 42 61

1950 53 54 68 64 58 82 37 57 61 84

1960 62 125 106 103 65 71 72 59 54 53

1970 58 76 52 61 53 75 50 51 66 54

1980 58 21 35 40 30 26 13 28 33 16

1990 18 20 18 18 14 11 5 19 6 15

2000 6 16 13 6 11 0 0 0 0 0

2010 0

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

1 211-a 1853 2010 158 6 0 .666 1.25 3.75 .799 .832 .265 2.61 .383 -.027 1

2 211-b 1825 2010 186 7 1 .565 1.06 2.70 .552 .836 .243 2.71 .361 .021 1

3 212-a 1943 2010 68 3 0 .546 1.77 3.53 .662 .690 .235 2.39 .374 -.003 1

4 212-b 1939 2010 72 3 0 .629 2.04 3.40 .672 .779 .203 2.34 .315 .019 1

5 213-a 1920 2010 91 4 0 .606 1.22 2.95 .632 .806 .256 2.66 .511 -.073 1

6 213-b 1925 2010 86 3 0 .644 .91 1.87 .412 .765 .260 2.59 .542 .052 1

7 214-a 1949 2010 62 3 0 .705 1.91 4.67 .774 .867 .169 2.61 .505 -.016 1

8 214-b 1941 2010 70 3 0 .507 1.89 3.82 .728 .842 .153 2.44 .426 -.052 1

9 215-a 1948 2010 63 3 0 .634 1.69 3.89 .869 .904 .202 2.66 .488 -.028 2

10 215-b 1944 2010 67 3 0 .556 1.51 3.54 .868 .920 .258 2.75 .498 .101 1

11 216-a 1895 2010 116 5 0 .637 1.01 2.46 .535 .751 .314 2.73 .477 -.025 1

12 216-b 1894 2010 117 5 0 .609 1.08 3.69 .698 .892 .263 2.54 .459 -.024 2

13 217-a 1918 2010 93 4 0 .685 1.84 4.07 1.201 .921 .266 2.96 .501 .092 1

14 217-b 1924 2010 87 4 0 .638 1.55 4.33 1.161 .932 .288 3.10 .506 .020 1

15 218-a 1930 2010 81 3 0 .533 1.46 4.07 .909 .872 .224 2.69 .359 -.043 2

16 218-b 1942 2010 69 3 0 .682 1.51 2.77 .582 .814 .194 2.46 .399 -.014 1

17 219-a 1936 2010 75 3 0 .651 2.20 4.28 .955 .837 .233 2.69 .633 .081 1

18 219-b 1923 2010 88 4 0 .457 1.38 2.88 .657 .818 .287 2.44 .382 -.029 1

19 220-a 1930 2010 81 3 0 .673 1.87 4.61 1.197 .910 .236 2.50 .388 -.042 1

20 220-b 1921 2010 90 4 0 .630 2.09 4.38 .912 .830 .225 2.56 .415 -.012 1

21 221-a 1824 2010 187 7 1 .512 1.01 2.80 .584 .884 .215 2.61 .398 -.016 1

22 221-b 1853 2010 158 6 0 .591 .83 3.11 .683 .940 .247 2.59 .371 -.060 1

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Total or mean: 2165 89 2 .602 1.40 4.67 .750 .851 .242 3.10 .431 -.006

- = [ COFECHA 82ELLCOF ] = -