[] Dendrochronology Program Library Run 101MI Program COF 13:41 Mon 11 Apr 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27861

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: 101\_MID\_corr1-30

File of DATED series: 101\_MID\_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 30 years lagged successively by 15 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 .4226

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 1860 to 2010 151 years

Continuous time span is 1860 to 2010 151 years

Portion with two or more series is 1891 to 2010 120 years

>> 538-a 1996 absent in 1 of 21 series, but is not usually narrow: master index is -.300

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

\*C\* Number of dated series 21 \*C\*

\*O\* Master series 1860 2010 151 yrs \*O\*

\*F\* Total rings in all series 1649 \*F\*

\*E\* Total dated rings checked 1618 \*E\*

\*C\* Series intercorrelation .598 \*C\*

\*H\* Average mean sensitivity .253 \*H\*

\*A\* Segments, possible problems 15 \*A\*

\*\*\* Mean length of series 78.5 \*\*\*

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

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

537-b 2 absent rings: 1911 1917

538-a 2 absent rings: 1996 2000

4 absent rings .243%

PART 2: TIME PLOT OF TREE-RING SERIES: 101\_MID\_corr1-30 13:41 Mon 11 Apr 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

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

. . . . . . . . . . . . . . . . . . .<====> . 531-a 1 1968 2010 43

. . . . . . . . . . . . . . . . . . <======> . 531-b 2 1946 2010 65

. . . . . . . . . . . . . . . . . . <========> . 532-a 3 1925 2010 86

. . . . . . . . . . . . . . . . . . <=======> . 532-b 4 1932 2010 79

. . . . . . . . . . . . . . . . . . <========> . 533-a 5 1922 2010 89

. . . . . . . . . . . . . . . . . . <=====> . 533-b 6 1956 2010 55

. . . . . . . . . . . . . . . . . . <======> . 534-a 7 1940 2010 71

. . . . . . . . . . . . . . . . . . <========> . 534-b 8 1924 2010 87

. . . . . . . . . . . . . . . . . . <======> . 535-a 9 1941 2010 70

. . . . . . . . . . . . . . . . . . <=======> . 535-b 10 1937 2010 74

. . . . . . . . . . . . . . . . . . <=======> . 536-a 11 1933 2010 78

. . . . . . . . . . . . . . . . . . <=======> . 536-b 12 1939 2010 72

. . . . . . . . . . . . . . . . .<==============> . 537-a 13 1860 2010 151

. . . . . . . . . . . . . . . . . <===========> . 537-b 14 1891 2010 120

. . . . . . . . . . . . . . . . . . <=======> . 538-a 15 1936 2010 75

. . . . . . . . . . . . . . . . . . <=======> . 538-b 16 1931 2010 80

. . . . . . . . . . . . . . . . . . <=======> . 539-a 17 1938 2010 73

. . . . . . . . . . . . . . . . . . <======> . 539-b 18 1940 2010 71

. . . . . . . . . . . . . . . . . . <======> . 540-a 19 1942 2010 69

. . . . . . . . . . . . . . . . . . <======> . 540-b 20 1943 2010 68

. . . . . . . . . . . . . . . . . . <=======> . 540-c 21 1938 2010 73

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

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

1900 .149 2 1950 -.228 19 2000 -1.658 21 1

1901 -.734 2 1951 -.005 19 2001 -.233 21

1902 1.724 2 1952 -.151 19 2002 .552 21

1903 3.043 2 1953 -2.530 19 2003 -2.263 21

1904 1.106 2 1954 .257 19 2004 -.644 21

1905 .567 2 1955 .688 19 2005 -.908 21

1906 -.026 2 1956 -.781 20 2006 .227 21

1907 -.685 2 1957 .995 20 2007 1.075 21

1908 -.180 2 1958 .650 20 2008 .612 21

1909 -.725 2 1959 .046 20 2009 .389 21

1860 1.736 1 1910 .369 2 1960 .561 20 2010 1.332 21

1861 .965 1 1911 -1.197 2 1 1961 1.049 20

1862 -.900 1 1912 .020 2 1962 -.439 20

1863 -.960 1 1913 .282 2 1963 -.132 20

1864 -.601 1 1914 -1.272 2 1964 .431 20

1865 .822 1 1915 -1.336 2 1965 .043 20

1866 1.483 1 1916 -.813 2 1966 -.334 20

1867 -.121 1 1917 -2.548 2 1 1967 -.166 20

1868 -1.086 1 1918 -1.540 2 1968 -.631 21

1869 1.593 1 1919 -1.155 2 1969 -.137 21

1870 -.100 1 1920 -2.227 2 1970 .396 21

1871 -.022 1 1921 -.469 2 1971 1.035 21

1872 1.309 1 1922 -.199 3 1972 .056 21

1873 .169 1 1923 -1.132 3 1973 -1.257 21

1874 -1.473 1 1924 1.368 4 1974 -.471 21

1875 -1.071 1 1925 1.130 5 1975 .445 21

1876 -2.511 1 1926 .545 5 1976 .386 21

1877 -1.433 1 1927 .871 5 1977 .572 21

1878 -.733 1 1928 .501 5 1978 .958 21

1879 .196 1 1929 -.387 5 1979 .660 21

1880 1.746 1 1930 -.882 5 1980 .923 21

1881 1.873 1 1931 -.658 6 1981 -1.353 21

1882 .729 1 1932 .846 7 1982 -.738 21

1883 .667 1 1933 .172 8 1983 -1.017 21

1884 .905 1 1934 .466 8 1984 -1.278 21

1885 1.461 1 1935 -1.455 8 1985 -.768 21

1886 2.176 1 1936 -.700 9 1986 -.926 21

1887 .683 1 1937 -.180 10 1987 1.066 21

1888 -.201 1 1938 .738 12 1988 .726 21

1889 -.316 1 1939 .967 13 1989 -.039 21

1890 .235 1 1940 -.804 15 1990 .509 21

1891 .322 2 1941 .581 16 1991 .798 21

1892 -1.205 2 1942 -.086 17 1992 1.245 21

1893 -2.697 2 1943 -.356 18 1993 1.462 21

1894 -1.134 2 1944 -.165 18 1994 .393 21

1895 -.654 2 1945 .128 18 1995 .277 21

1896 .044 2 1946 .357 19 1996 -.300 21 1<<

1897 .592 2 1947 .980 19 1997 .295 21

1898 .879 2 1948 -.489 19 1998 -.561 21

1899 1.008 2 1949 .636 19 1999 -.677 21

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PART 4: Master Bar Plot: 101\_MID\_corr1-30 13:41 Mon 11 Apr 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

1900-----A 1950----a 2000g

1901--c 1951-----@ 2001----a

1902----------G 1952----a 2002-------B

1903----------L 1953j 2003i

1904---------D 1954------A 2004--c

1905-------B 1955--------C 2005--d

1906-----@ 1956--c 2006------A

1907--c 1957---------D 2007---------D

1908----a 1958--------C 2008-------B

1909--c 1959-----@ 2009------B

1860----------G 1910------A 1960-------B 2010----------E

1861---------D 1911-e 1961---------D

1862--d 1912-----@ 1962---b

1863-d 1913------A 1963----a

1864---b 1914-e 1964------B

1865--------C 1915e 1965-----@

1866----------F 1916--c 1966---a

1867----@ 1917j 1967----a

1868-d 1918f 1968--c

1869----------F 1919-e 1969----a

1870----@ 1920i 1970------B

1871-----@ 1921---b 1971---------D

1872----------E 1922----a 1972-----@

1873-----A 1923-e 1973-e

1874f 1924----------E 1974---b

1875-d 1925---------E 1975-------B

1876j 1926-------B 1976------B

1877f 1927--------C 1977-------B

1878--c 1928-------B 1978---------D

1879------A 1929---b 1979--------C

1880----------G 1930--d 1980---------D

1881----------G 1931--c 1981e

1882--------C 1932--------C 1982--c

1883--------C 1933-----A 1983-d

1884---------D 1934-------B 1984-e

1885----------F 1935f 1985--c

1886----------I 1936--c 1986-d

1887--------C 1937----a 1987---------D

1888----a 1938--------C 1988--------C

1889----a 1939---------D 1989-----@

1890------A 1940--c 1990-------B

1891------A 1941-------B 1991--------C

1892-e 1942----@ 1992---------E

1893k 1943---a 1993----------F

1894-e 1944----a 1994------B

1895--c 1945-----A 1995------A

1896-----@ 1946------A 1996----a

1897-------B 1947---------D 1997------A

1898---------D 1948---b 1998---b

1899---------D 1949-------C 1999--c

PART 5: CORRELATION OF SERIES BY SEGMENTS: 101\_MID\_corr1-30 13:41 Mon 11 Apr 2011 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1890 1905 1920 1935 1950 1965 1980 1995

1919 1934 1949 1964 1979 1994 2009 2024

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

1 531-a 1968 2010 .32A .74 .75

2 531-b 1946 2010 .52 .50 .56 .71 .72

3 532-a 1925 2010 .63 .67 .50 .68 .82 .83

4 532-b 1932 2010 .75 .70 .46 .56 .55 .57

5 533-a 1922 2010 .41A .45 .46 .69 .69 .69

6 533-b 1956 2010 .41A .33B .21B .31A

7 534-a 1940 2010 .71 .79 .65 .69 .66

8 534-b 1924 2010 .56 .65 .79 .72 .78 .74

9 535-a 1941 2010 .70 .73 .56 .67 .67

10 535-b 1937 2010 .66 .64 .65 .86 .88

11 536-a 1933 2010 .20B .21B .39B .63 .60 .61

12 536-b 1939 2010 .58 .71 .71 .82 .83

13 537-a 1860 2010 .80 .68 .69 .67 .50 .78 .87 .87

14 537-b 1891 2010 .76 .52 .59 .59 .50 .69 .72 .73

15 538-a 1936 2010 .40A .39A .41A .55 .54

16 538-b 1931 2010 .53 .53 .64 .64 .68 .69

17 539-a 1938 2010 .55 .64 .63 .66 .67

18 539-b 1940 2010 .70 .57 .26A .59 .59

19 540-a 1942 2010 .23B .35B .64 .81 .80

20 540-b 1943 2010 .48 .46 .56 .70 .71

21 540-c 1938 2010 .42 .50 .60 .74 .75

Av segment correlation .78 .60 .55 .55 .55 .58 .69 .70

PART 6: POTENTIAL PROBLEMS: 101\_MID\_corr1-30 13:41 Mon 11 Apr 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 30-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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531-a 1968 to 2010 43 years Series 1

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

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

1968 1997 0 .05 -.10 .11 -.33 -.10 .11 .15 .28 .13 .12 .32\*-.18 -.06 -.08 .09 .05 -.02 -.10 -.19 .05 -.45

[B] Entire series, effect on correlation ( .595) is:

Lower 1973> -.046 1998> -.032 1987< -.032 1975< -.030 1978< -.030 1996> -.027 Higher 2003 .209 1981 .031

1968 to 1997 segment:

Lower 1973> -.074 1978< -.059 1975< -.059 1987< -.058 1996> -.049 1977< -.028 Higher 1981 .196 1993 .050

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

1973 +3.4 SD; 1996 +3.3 SD

531-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1968 243 214

1970 210 356 250 259 252 173 167 160 156 195

1980 330 192 197 237 215 245 279 274 338 307

1990 427 448 458 554 376 450 540 483 487 333

2000 296 305 406 221 350 250 334 395 357 318

2010 395

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531-b 1946 to 2010 65 years Series 2

[B] Entire series, effect on correlation ( .620) is:

Lower 1952< -.060 1973> -.026 2005> -.016 1967< -.014 1956> -.012 2009< -.009 Higher 1953 .057 2003 .024

531-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 241 262 236 236

1950 228 326 240 148 239 334 368 540 628 538

1960 556 527 419 362 327 327 289 206 181 335

1970 543 524 442 441 340 302 367 528 488 502

1980 509 343 261 273 200 203 271 398 374 282

1990 400 418 359 347 250 220 145 174 144 133

2000 104 135 170 127 175 224 195 269 215 160

2010 286

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532-a 1925 to 2010 86 years Series 3

[B] Entire series, effect on correlation ( .677) is:

Lower 1930< -.029 1955< -.018 1950> -.014 1939< -.012 1928< -.011 1962> -.011 Higher 2003 .052 1935 .048

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

1930 -6.0 SD; 1962 +3.3 SD

532-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 255 236 264 230 205

1930 175 222 294 284 334 256 235 253 315 289

1940 274 322 315 266 322 368 302 376 293 347

1950 386 290 199 104 165 139 101 175 193 185

1960 301 373 306 252 192 138 182 133 106 92

1970 119 139 127 91 112 152 121 117 150 171

1980 164 85 66 88 78 66 49 91 123 149

1990 167 132 190 188 178 120 87 131 101 114

2000 103 143 147 76 54 73 125 201 191 181

2010 244

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532-b 1932 to 2010 79 years Series 4

[B] Entire series, effect on correlation ( .608) is:

Lower 2003> -.020 1962> -.017 2008< -.015 1969< -.015 1998< -.010 1973> -.009 Higher 1935 .062 1981 .019

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

1962 +3.3 SD

532-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 415 386 409 285 267 292 289 287

1940 255 279 211 191 204 244 195 275 198 251

1950 228 174 153 99 140 132 93 208 259 199

1960 277 263 250 142 147 130 131 107 89 55

1970 74 99 105 121 161 187 186 229 241 238

1980 239 140 108 149 182 161 134 198 246 221

1990 230 222 304 317 301 196 167 220 117 175

2000 142 182 219 155 123 102 167 225 131 216

2010 326

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533-a 1922 to 2010 89 years Series 5

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

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

1922 1951 0 .01 -.21 -.04 -.10 .00 -.05 -.17 -.12 .20 -.35 .41\*-.09 .13 .27 -.38 .05 .21 -.04 .19 -.28 -.06

[B] Entire series, effect on correlation ( .553) is:

Lower 1935> -.044 1932< -.013 1987< -.011 1954< -.009 1973> -.009 1999> -.008 Higher 2003 .055 1981 .041

1922 to 1951 segment:

Lower 1935> -.118 1932< -.038 1950< -.024 1936> -.019 1934< -.018 1926> -.012 Higher 1924 .039 1948 .033

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

2006 +3.8 SD

533-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 148 123 190 213 229 228 183 120

1930 129 143 135 107 118 137 217 199 281 293

1940 199 210 158 146 164 147 143 189 127 205

1950 108 148 121 92 112 127 148 308 266 235

1960 178 213 210 227 178 170 168 150 144 206

1970 292 354 263 227 180 205 223 250 212 191

1980 211 108 125 147 139 122 94 110 124 112

1990 184 163 175 176 111 158 116 165 117 145

2000 121 125 148 96 95 107 192 148 141 131

2010 145

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

533-b 1956 to 2010 55 years Series 6

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

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

1956 1985 0 -.15 -.28 .20 -.03 .00 -.22 -.03 .21 -.11 .00 .41\* .14 -.09 .16 -.26 -.28 -.08 .06 -.02 .07 .02

1965 1994 1 -.29 -.20 .09 .30 -.08 -.08 .10 -.14 .01 -.10 .33| .39\*-.10 -.01 -.29 -.20 -.11 -.02 .05 .04 -.07

1980 2009 -2 -.28 -.32 -.06 .19 .00 .03 .21 -.09 .25\*-.15 .21| .18 - - - - - - - - -

1981 2010 0 -.32 -.24 -.02 -.09 .01 .03 .25 -.02 .29 -.11 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .315) is:

Lower 2003> -.106 1988< -.044 1980< -.029 2002< -.022 1962> -.020 1998> -.017 Higher 1981 .061 2000 .053

1956 to 1985 segment:

Lower 1980< -.074 1962> -.048 1973> -.046 1984> -.039 1968> -.018 1974< -.015 Higher 1981 .119 1956 .061

1965 to 1994 segment:

Lower 1988< -.095 1980< -.060 1973> -.046 1984> -.041 1968> -.020 1986> -.015 Higher 1981 .148 1987 .050

1980 to 2009 segment:

Lower 2003> -.153 1988< -.072 1980< -.044 2002< -.032 1998> -.026 1984> -.025 Higher 1981 .107 2000 .091

1981 to 2010 segment:

Lower 2003> -.161 1988< -.083 2002< -.036 1998> -.024 1984> -.023 2001< -.012 Higher 1981 .097 2000 .073

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

2002 2003 4.7 SD

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

1998 +3.3 SD

533-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 72 217 227 197

1960 193 212 243 208 215 176 169 172 244 281

1970 358 365 329 330 254 328 376 501 435 442

1980 308 238 316 312 357 278 318 423 280 256

1990 346 364 329 404 328 390 359 472 425 331

2000 217 229 217 300 322 276 319 343 377 362

2010 557

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534-a 1940 to 2010 71 years Series 7

[B] Entire series, effect on correlation ( .642) is:

Lower 1948< -.044 1981> -.024 2003> -.013 1955< -.012 1959< -.012 2010< -.011 Higher 1953 .072 1987 .009

534-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 106 116 130 135 118 124 144 173 64 122

1950 102 137 121 44 136 101 95 162 156 90

1960 133 155 136 144 177 163 130 122 101 141

1970 197 194 176 133 137 246 275 292 296 317

1980 286 174 197 105 87 121 101 231 147 133

1990 134 154 172 186 195 179 111 103 102 93

2000 98 202 221 156 253 253 304 379 324 352

2010 336

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

534-b 1924 to 2010 87 years Series 8

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

Lower 1935> -.048 1931< -.028 2010< -.010 1926< -.009 1955< -.008 1961< -.006 Higher 1953 .055 2003 .013

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

1931 -5.0 SD; 1953 -4.8 SD

534-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 58 74 45 52 68 44

1930 52 30 62 73 76 83 95 126 153 150

1940 117 124 133 134 132 131 133 175 106 153

1950 113 133 114 45 176 123 91 130 140 92

1960 101 100 81 100 197 167 145 121 127 124

1970 109 133 91 53 80 93 108 152 173 156

1980 157 96 124 90 67 95 78 119 98 66

1990 87 106 123 145 109 82 74 73 55 60

2000 45 69 83 56 85 97 108 138 161 122

2010 114

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535-a 1941 to 2010 70 years Series 9

[B] Entire series, effect on correlation ( .668) is:

Lower 1948> -.018 1998> -.017 2006< -.017 1968> -.015 1993< -.011 1984< -.011 Higher 2003 .065 1953 .046

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

1969 +3.6 SD; 2004 +3.6 SD

535-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 215 184 148 216 172 154 286 197 164

1950 149 161 205 75 277 210 97 171 158 118

1960 217 246 111 151 174 137 155 179 192 225

1970 190 155 123 75 112 127 127 115 126 126

1980 139 102 130 125 72 140 99 252 277 213

1990 242 215 261 182 179 169 200 210 233 196

2000 174 222 278 148 266 183 183 217 233 223

2010 241

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535-b 1937 to 2010 74 years Series 10

[B] Entire series, effect on correlation ( .697) is:

Lower 1949< -.023 1971< -.019 1942> -.015 1957< -.013 1956< -.011 2001< -.010 Higher 1953 .045 2003 .033

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

1954 +3.0 SD

535-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 230 235 199

1940 142 230 242 159 181 151 117 182 112 90

1950 127 133 145 62 219 143 58 88 116 96

1960 190 161 111 141 185 144 150 174 162 186

1970 149 108 91 55 139 162 175 134 166 152

1980 132 65 89 90 93 131 128 299 346 253

1990 290 315 304 259 236 199 181 186 133 129

2000 78 82 131 65 98 108 109 133 162 139

2010 206

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536-a 1933 to 2010 78 years Series 11

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

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

1933 1962 -5 .21 -.08 -.07 -.07 .12 .29\*-.36 -.18 .12 -.30 .20|-.01 -.21 .19 .05 -.11 .24 .01 .07 .02 .01

1935 1964 -5 .25 -.09 -.05 -.06 .10 .28\*-.39 -.20 .15 -.30 .21|-.11 -.27 .20 .08 -.09 .21 .00 .06 .03 .03

1950 1979 -5 .40 .03 .07 -.14 .06 .42\*-.32 -.04 -.03 -.43 .39|-.02 -.22 .09 .34 -.10 -.07 -.08 -.07 .21 .04

[B] Entire series, effect on correlation ( .382) is:

Lower 1935> -.091 1958< -.068 1977< -.016 1999< -.013 1934< -.011 1946< -.009 Higher 1953 .036 1981 .034

1933 to 1962 segment:

Lower 1935> -.183 1958< -.126 1934< -.020 1946< -.017 1940> -.010 1956> -.010 Higher 1953 .107 1957 .050

1935 to 1964 segment:

Lower 1935> -.187 1958< -.127 1946< -.017 1964< -.012 1940> -.011 1956> -.011 Higher 1953 .107 1957 .049

1950 to 1979 segment:

Lower 1958< -.212 1977< -.045 1964< -.021 1968> -.018 1956> -.017 1966> -.011 Higher 1953 .112 1957 .044

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

1935 +3.6 SD; 2004 +3.4 SD

536-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 106 78 140 95 94 230 174

1940 126 119 74 106 89 69 52 62 52 100

1950 72 89 98 56 120 123 102 158 64 69

1960 108 100 56 63 64 89 111 130 127 119

1970 125 141 100 80 103 128 107 65 82 74

1980 81 47 49 31 23 41 36 56 48 46

1990 40 52 58 75 67 61 58 73 46 14

2000 14 29 70 48 124 105 111 117 98 99

2010 141

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

536-b 1939 to 2010 72 years Series 12

[B] Entire series, effect on correlation ( .736) is:

Lower 1943> -.016 1946< -.015 1989> -.011 1958< -.010 1949< -.009 1969> -.009 Higher 2003 .075 1953 .010

536-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 190

1940 119 116 94 131 118 108 70 95 69 66

1950 56 48 44 30 103 112 92 135 85 64

1960 86 100 92 140 148 113 98 124 110 184

1970 183 205 147 103 108 139 123 136 153 118

1980 99 68 81 67 46 54 68 84 91 103

1990 81 99 106 106 84 69 73 108 77 60

2000 65 144 173 70 136 104 136 195 189 232

2010 258

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537-a 1860 to 2010 151 years Series 13

[\*] Early part of series cannot be checked from 1860 to 1890 -- not matched by another series

[B] Entire series, effect on correlation ( .719) is:

Lower 1904> -.017 1930> -.012 1891< -.010 1955< -.009 1929> -.009 1977< -.006 Higher 2003 .026 1935 .019

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1930 +3.9 SD; 1931 +3.2 SD; 2003 -4.5 SD

537-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1860 40 35 26 26 29 38 45 33 29 51

1870 36 38 53 42 30 33 24 31 38 51

1880 82 88 63 62 66 78 95 58 43 40

1890 46 35 22 15 21 25 29 39 39 42

1900 30 22 54 85 44 34 27 21 26 19

1910 30 14 23 25 13 12 18 11 16 22

1920 14 32 39 29 70 58 57 75 85 105

1930 118 122 156 125 117 34 63 65 78 148

1940 119 190 156 112 119 139 190 212 99 245

1950 174 173 100 61 72 54 52 84 110 83

1960 100 215 166 111 156 138 100 144 80 87

1970 104 137 84 38 88 137 167 106 134 142

1980 151 74 65 57 65 87 94 179 147 136

1990 158 190 255 238 204 172 165 160 130 89

2000 73 85 137 49 106 121 147 141 146 205

2010 235

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537-b 1891 to 2010 120 years Series 14

[B] Entire series, effect on correlation ( .643) is:

Lower 1948> -.017 1962> -.011 1935< -.009 1925< -.009 1929> -.009 1996> -.009 Higher 1903 .018 1953 .018

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

1934 1935 -4.1 SD

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

1911 -1.197 2 1

Present in series 13 537-a time span 1860 to 2010

1917 -2.548 2 1

Present in series 13 537-a time span 1860 to 2010

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1935 -6.7 SD; 1948 +3.1 SD; 1962 +3.1 SD; 1996 +3.3 SD

537-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1891 45 31 20 29 31 41 43 52 53

1900 36 19 61 96 36 26 16 7 9 5

1910 9 0 8 9 5 6 6 0 6 8

1920 8 21 33 34 106 73 78 79 78 95

1930 81 78 102 83 102 33 56 57 96 129

1940 99 145 147 125 193 189 170 186 228 242

1950 168 194 131 46 64 58 63 73 117 154

1960 150 166 179 165 142 141 93 115 92 85

1970 82 81 103 46 84 138 179 164 187 151

1980 202 118 74 72 76 94 123 244 228 195

1990 185 194 219 261 230 237 287 214 137 77

2000 61 80 102 42 64 67 79 84 111 169

2010 186

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

538-a 1936 to 2010 75 years Series 15

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

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

1936 1965 0 .19 .37 -.11 -.06 .17 -.16 .07 .01 -.39 -.27 .40\*-.12 -.10 .24 -.15 -.10 .22 -.17 -.16 .13 .09

1950 1979 0 .13 .31 -.07 -.07 .06 -.24 -.03 .14 -.34 -.13 .39\*-.37 -.12 .16 .17 -.02 .24 -.17 -.09 -.07 -.18

1965 1994 0 -.24 -.08 .06 -.02 -.21 .08 .05 -.02 .10 -.07 .41\*-.26 -.14 .07 .22 .09 -.17 -.12 .17 -.03 -.33

[B] Entire series, effect on correlation ( .401) is:

Lower 1970< -.039 1939< -.019 1977< -.017 1998> -.016 1984> -.016 1948> -.015 Higher 1981 .038 2000 .025

1936 to 1965 segment:

Lower 1939< -.046 1948> -.044 1941< -.034 1960< -.016 1936> -.013 1962< -.012 Higher 1940 .024 1956 .022

1950 to 1979 segment:

Lower 1970< -.087 1977< -.037 1972> -.027 1953> -.017 1960< -.015 1952> -.011 Higher 1971 .027 1973 .024

1965 to 1994 segment:

Lower 1970< -.147 1977< -.061 1984> -.050 1972> -.035 1982> -.021 1974> -.011 Higher 1981 .167 1973 .047

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

1996 -.300 21 1 >> WARNING: Ring is not usually narrow

2000 -1.658 21 1

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1955 +3.8 SD; 1962 -6.0 SD; 1970 -5.5 SD; 1984 +3.4 SD; 1996 -5.5 SD

538-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 256 191 211 30

1940 24 38 50 69 80 131 142 123 149 159

1950 123 161 160 106 186 347 143 171 145 135

1960 112 145 75 97 123 92 106 107 84 91

1970 72 112 113 82 96 87 84 71 97 84

1980 97 66 91 82 88 78 71 89 71 60

1990 63 67 104 95 67 49 0 52 62 16

2000 0 18 18 15 27 36 34 58 75 73

2010 74

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538-b 1931 to 2010 80 years Series 16

[B] Entire series, effect on correlation ( .587) is:

Lower 1935> -.041 1939< -.025 1947< -.020 1950> -.015 1974> -.014 1941< -.010 Higher 1953 .045 1981 .040

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

1935 +3.0 SD; 1974 +3.2 SD

538-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 151 239 166 190 128 91 109 162 73

1940 24 29 32 24 28 30 72 46 34 97

1950 171 192 169 63 110 205 136 273 294 330

1960 341 367 249 245 319 241 278 300 229 287

1970 300 308 260 234 294 266 236 255 245 240

1980 263 170 175 168 196 254 270 301 225 178

1990 162 265 361 413 340 261 224 223 89 49

2000 29 51 104 58 116 136 165 214 205 158

2010 209

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539-a 1938 to 2010 73 years Series 17

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

Lower 1940< -.035 2003> -.031 1938< -.029 1976< -.016 2004< -.012 1974< -.011 Higher 1953 .025 1981 .016

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

1940 -6.0 SD; 1970 +3.0 SD

539-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 150 203

1940 126 235 239 258 239 299 308 321 288 281

1950 272 287 323 253 333 383 284 377 296 262

1960 283 385 254 291 266 281 219 217 212 230

1970 309 289 182 150 119 162 122 143 136 156

1980 170 114 164 137 148 142 102 195 163 133

1990 214 217 262 304 146 150 88 108 106 107

2000 111 175 173 115 83 98 196 215 186 182

2010 222

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539-b 1940 to 2010 71 years Series 18

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

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

1965 1994 0 .13 -.25 -.29 -.11 -.08 .00 .02 -.13 .24 .14 .26\* .02 .03 .12 .03 .23 -.01 .23 -.23 -.13 -.15

[B] Entire series, effect on correlation ( .513) is:

Lower 1973> -.034 1978< -.030 1981> -.023 1974< -.023 1948> -.021 1960< -.016 Higher 1953 .096 1987 .014

1965 to 1994 segment:

Lower 1973> -.089 1978< -.080 1974< -.035 1979< -.033 1981> -.030 1977< -.012 Higher 1987 .062 1971 .039

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

1955 +3.3 SD; 1973 +3.8 SD

539-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 213 248 211 229 225 244 315 286 311 355

1950 271 312 313 224 349 449 288 382 349 325

1960 271 367 280 284 281 317 260 304 251 232

1970 329 333 238 264 147 198 174 158 122 114

1980 155 151 191 113 131 140 128 256 193 191

1990 245 270 278 249 189 157 112 129 172 190

2000 149 237 252 140 117 127 178 264 230 250

2010 236

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540-a 1942 to 2010 69 years Series 19

[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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1942 1971 2 .08 .16 .14 -.13 -.12 -.26 .09 -.05 -.35 .09 .23|-.01 .30\* .07 -.03 .14 .11 -.38 -.30 .06 -.07

1950 1979 2 .20 .01 .04 .03 .08 -.20 -.14 -.07 -.36 .11 .35| .07 .37\* .02 -.19 -.09 -.09 -.36 -.21 -.11 .13

[B] Entire series, effect on correlation ( .619) is:

Lower 1953> -.052 1999> -.021 1951< -.015 1956> -.012 1996< -.011 1971< -.009 Higher 2003 .120 1981 .029

1942 to 1971 segment:

Lower 1953> -.037 1951< -.037 1956> -.019 1971< -.019 1942> -.016 1969< -.016 Higher 1962 .042 1955 .036

1950 to 1979 segment:

Lower 1953> -.087 1951< -.038 1956> -.023 1971< -.021 1969< -.016 1979< -.015 Higher 1973 .066 1962 .033

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

1956 +3.1 SD

540-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 210 190 155 221 235 189 160 183

1950 114 79 92 115 137 287 202 182 171 182

1960 173 134 88 80 127 129 97 91 82 63

1970 64 65 60 39 56 73 95 117 134 77

1980 81 39 60 61 55 64 70 116 98 69

1990 66 72 81 93 80 99 71 99 92 165

2000 114 187 221 120 189 182 254 312 278 271

2010 313

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540-b 1943 to 2010 68 years Series 20

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

Lower 1999> -.030 1953> -.024 1956> -.019 1952> -.015 1994< -.013 1993< -.009 Higher 2003 .125 1987 .010

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1953 +3.3 SD; 1956 +3.0 SD; 1999 +4.4 SD; 2001 +4.4 SD

540-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 166 157 154 255 289 185 260

1950 216 208 269 203 205 266 243 255 225 201

1960 208 182 116 106 128 102 63 52 48 49

1970 48 56 58 48 58 84 80 82 84 73

1980 71 39 44 44 42 43 51 91 105 70

1990 72 94 91 92 69 101 104 118 127 189

2000 135 225 189 81 118 134 169 207 185 165

2010 242

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540-c 1938 to 2010 73 years Series 21

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

Lower 1953> -.023 1961< -.020 1951< -.016 1938< -.015 1992< -.014 1991< -.013 Higher 2003 .112 1987 .012

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

1955 +3.1 SD; 1978 +3.1 SD

540-c Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 191 263

1940 194 234 163 150 148 143 185 143 108 157

1950 104 60 87 79 167 256 128 182 124 153

1960 117 79 49 67 80 110 97 120 111 97

1970 110 128 96 59 66 99 78 112 168 96

1980 78 44 51 54 54 64 64 121 106 71

1990 65 61 68 96 78 88 108 99 82 149

2000 139 200 241 108 196 177 251 318 254 260

2010 317

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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 ()

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

1 531-a 1968 2010 43 3 1 .595 3.12 5.54 1.063 .706 .195 2.70 .472 -.088 1

2 531-b 1946 2010 65 5 0 .620 3.13 6.28 1.310 .827 .211 2.76 .537 .096 2

3 532-a 1925 2010 86 6 0 .677 1.89 3.86 .884 .861 .229 2.58 .514 .016 2

4 532-b 1932 2010 79 6 0 .608 2.01 4.15 .758 .758 .222 2.48 .428 -.032 1

5 533-a 1922 2010 89 6 1 .553 1.69 3.54 .541 .654 .203 2.76 .436 -.045 1

6 533-b 1956 2010 55 4 4 .315 3.07 5.57 .922 .682 .178 2.75 .621 .079 1

7 534-a 1940 2010 71 5 0 .642 1.68 3.79 .741 .783 .235 2.44 .438 -.085 1

8 534-b 1924 2010 87 6 0 .609 1.05 1.97 .366 .616 .247 2.60 .374 -.066 1

9 535-a 1941 2010 70 5 0 .668 1.77 2.86 .533 .325 .267 2.62 .549 -.088 1

10 535-b 1937 2010 74 5 0 .697 1.56 3.46 .642 .687 .273 2.79 .560 -.014 1

11 536-a 1933 2010 78 6 3 .382 .85 2.30 .382 .624 .285 2.83 .501 .036 1

12 536-b 1939 2010 72 5 0 .736 1.09 2.58 .453 .706 .244 2.57 .416 -.023 1

13 537-a 1860 2010 151 8 0 .719 .87 2.55 .588 .822 .293 2.75 .381 -.015 1

14 537-b 1891 2010 120 8 0 .643 1.00 2.87 .698 .886 .339 2.60 .318 -.018 1

15 538-a 1936 2010 75 5 3 .401 .94 3.47 .574 .674 .356 3.04 .489 -.052 1

16 538-b 1931 2010 80 6 0 .587 1.90 4.13 .979 .845 .292 2.56 .438 .017 1

17 539-a 1938 2010 73 5 0 .556 2.10 3.85 .780 .764 .204 2.52 .391 -.083 1

18 539-b 1940 2010 71 5 1 .513 2.34 4.49 .763 .710 .198 2.67 .475 -.051 1

19 540-a 1942 2010 69 5 2 .619 1.31 3.13 .698 .825 .232 2.63 .409 -.076 1

20 540-b 1943 2010 68 5 0 .630 1.32 2.89 .726 .858 .194 2.56 .363 .005 1

21 540-c 1938 2010 73 5 0 .630 1.29 3.18 .660 .746 .271 2.64 .384 -.044 1

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Total or mean: 1649 114 15 .598 1.60 6.28 .696 .740 .253 3.04 .442 -.025

- = [ COFECHA 101MICOF ] = -