[] Dendrochronology Program Library Run ACRU Program COF 11:26 Tue 25 Jul 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30158

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: ACRU\_VMC1235\_CORR3-50

File of DATED series: ACRU\_VMC1235\_CORR3

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 1870 to 2015 146 years

Continuous time span is 1870 to 2015 146 years

Portion with two or more series is 1874 to 2015 142 years

>> 251A 2012 absent in 1 of 27 series, but is not usually narrow: master index is .590

>> 253A 2011 absent in 2 of 27 series, but is not usually narrow: master index is 1.175

>> 253B 2003 absent in 1 of 28 series, but is not usually narrow: master index is .017

>> 253B 2005 absent in 1 of 28 series, but is not usually narrow: master index is .301

>> 253B 2011 absent in 2 of 27 series, but is not usually narrow: master index is 1.175

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

\*C\* Number of dated series 28 \*C\*

\*O\* Master series 1870 2015 146 yrs \*O\*

\*F\* Total rings in all series 2340 \*F\*

\*E\* Total dated rings checked 2336 \*E\*

\*C\* Series intercorrelation .461 \*C\*

\*H\* Average mean sensitivity .241 \*H\*

\*A\* Segments, possible problems 13 \*A\*

\*\*\* Mean length of series 83.6 \*\*\*

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

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

247A 4 absent rings: 1928 1929 1937 1938

251A 1 absent rings: 2012

253A 1 absent rings: 2011

253B 4 absent rings: 2003 2005 2006 2011

10 absent rings .427%

PART 2: TIME PLOT OF TREE-RING SERIES: ACRU\_VMC1235\_CORR3 11:26 Tue 25 Jul 2017 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

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

. . . . . . . . . . . . . . . . . .<=========> . 242A 1 1917 2015 99

. . . . . . . . . . . . . . . . . .<========> . 242B 2 1915 2006 92

. . . . . . . . . . . . . . . . . <=============> . 243B 3 1877 2015 139

. . . . . . . . . . . . . . . . . <=============> . 247A 4 1876 2015 140

. . . . . . . . . . . . . . . . . <===========> . 247B 5 1899 2015 117

. . . . . . . . . . . . . . . . . . .<====> . 248A 6 1960 2015 56

. . . . . . . . . . . . . . . . . . .<====> . 248B 7 1960 2015 56

. . . . . . . . . . . . . . . . . . <======> . 249A 8 1948 2015 68

. . . . . . . . . . . . . . . . . . <=====> . 249B 9 1959 2015 57

. . . . . . . . . . . . . . . . . . .<====> . 249C 10 1962 2015 54

. . . . . . . . . . . . . . . . . . <======> . 250A 11 1941 2014 74

. . . . . . . . . . . . . . . . . . <=====> . 250B 12 1950 2015 66

. . . . . . . . . . . . . . . . . <============> . 251A 13 1882 2015 134

. . . . . . . . . . . . . . . . . <============> . 251B 14 1886 2015 130

. . . . . . . . . . . . . . . . . . <======> . 252A 15 1941 2015 75

. . . . . . . . . . . . . . . . . . <=======> . 252B 16 1938 2015 78

. . . . . . . . . . . . . . . . . . . <===> . 253A 17 1972 2014 43

. . . . . . . . . . . . . . . . . . <=====> . 253B 18 1957 2014 58

. . . . . . . . . . . . . . . . . . <======> . 254A 19 1943 2015 73

. . . . . . . . . . . . . . . . . . <======> . 254B 20 1944 2014 71

. . . . . . . . . . . . . . . . . . <=====> . 255A 21 1956 2015 60

. . . . . . . . . . . . . . . . . . .<====> . 255B 22 1961 2015 55

. . . . . . . . . . . . . . . . . <=============> . 260A 23 1874 2015 142

. . . . . . . . . . . . . . . . . <=============> . 260B 24 1870 2015 146

. . . . . . . . . . . . . . . . . . .<====> . 265A 25 1960 2015 56

. . . . . . . . . . . . . . . . . . .<====> . 265B 26 1961 2015 55

. . . . . . . . . . . . . . . . . . <======> . 282A 27 1943 2015 73

. . . . . . . . . . . . . . . . . . <======> . 282B 28 1942 2014 73

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

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

1900 .200 7 1950 -2.153 18 2000 -.212 28

1901 .721 7 1951 -.350 18 2001 .309 28

1902 .448 7 1952 1.269 18 2002 -.782 28

1903 -1.747 7 1953 1.188 18 2003 .017 28 1<<

1904 .966 7 1954 -1.470 18 2004 -.592 28

1905 2.279 7 1955 -.338 18 2005 .301 28 1<<

1906 .798 7 1956 .179 19 2006 -.760 28 1

1907 -.178 7 1957 .045 20 2007 -1.320 27

1908 -1.534 7 1958 .355 20 2008 -.212 27

1909 -.680 7 1959 .494 21 2009 .580 27

1910 .516 7 1960 .353 24 2010 1.114 27

1911 1.601 7 1961 -.181 26 2011 1.175 27 2<<

1912 -.167 7 1962 .679 27 2012 .590 27 1<<

1913 -.301 7 1963 -.483 27 2013 1.234 27

1914 -.487 7 1964 .010 27 2014 -.356 27

1915 -1.191 8 1965 .063 27 2015 -.553 22

1916 .289 8 1966 -1.566 27

1917 -.095 9 1967 -1.591 27

1918 -1.056 9 1968 .142 27

1919 -1.319 9 1969 -.312 27

1870 -1.253 1 1920 -1.210 9 1970 1.004 27

1871 .569 1 1921 .699 9 1971 .321 27

1872 -.485 1 1922 -.089 9 1972 .822 28

1873 1.158 1 1923 1.299 9 1973 1.095 28

1874 2.060 2 1924 .462 9 1974 -.825 28

1875 2.246 2 1925 1.527 9 1975 .053 28

1876 1.199 3 1926 1.418 9 1976 .642 28

1877 -.569 4 1927 .240 9 1977 .724 28

1878 1.247 4 1928 -1.594 9 1 1978 .186 28

1879 -.544 4 1929 -1.600 9 1 1979 .573 28

1880 1.133 4 1930 -.813 9 1980 .713 28

1881 -.550 4 1931 .304 9 1981 1.433 28

1882 .236 5 1932 .443 9 1982 -.568 28

1883 -3.286 5 1933 .593 9 1983 -2.275 28

1884 -.683 5 1934 .247 9 1984 -.754 28

1885 -1.259 5 1935 .737 9 1985 -.177 28

1886 .152 6 1936 -.507 9 1986 -.899 28

1887 .691 6 1937 -2.222 9 1 1987 -1.202 28

1888 .018 6 1938 -1.617 10 1 1988 -1.172 28

1889 -1.933 6 1939 -.056 10 1989 -.337 28

1890 1.896 6 1940 .046 10 1990 .606 28

1891 -1.646 6 1941 -.696 12 1991 .067 28

1892 -.220 6 1942 .086 13 1992 .310 28

1893 -.253 6 1943 .931 15 1993 .757 28

1894 .844 6 1944 .495 16 1994 .027 28

1895 .279 6 1945 .378 16 1995 .305 28

1896 -1.307 6 1946 .563 16 1996 -.597 28

1897 1.719 6 1947 .836 16 1997 .205 28

1898 1.267 6 1948 .799 17 1998 -.005 28

1899 .453 7 1949 -2.322 17 1999 .482 28

PART 5: CORRELATION OF SERIES BY SEGMENTS: ACRU\_VMC1235\_CORR3 11:26 Tue 25 Jul 2017 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 1850 1875 1900 1925 1950 1975

1899 1924 1949 1974 1999 2024

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

1 242A 1917 2015 .71 .74 .46 .44

2 242B 1915 2006 .44 .45 .51 .38

3 243B 1877 2015 .42 .28A .20B .28B .20B

4 247A 1876 2015 .54 .49 .40 .25B .24A

5 247B 1899 2015 .42 .43 .41 .26B .14B

6 248A 1960 2015 .27A .32A

7 248B 1960 2015 .32A .34

8 249A 1948 2015 .49 .60 .35

9 249B 1959 2015 .53 .55

10 249C 1962 2015 .51 .52

11 250A 1941 2014 .55 .43 .31A

12 250B 1950 2015 .61 .63

13 251A 1882 2015 .43 .45 .54 .45 .40

14 251B 1886 2015 .51 .59 .65 .43 .43

15 252A 1941 2015 .56 .39 .31A

16 252B 1938 2015 .59 .59 .48

17 253A 1972 2014 .37

18 253B 1957 2014 .38 .39

19 254A 1943 2015 .62 .69 .61

20 254B 1944 2014 .44 .35 .46

21 255A 1956 2015 .33 .42

22 255B 1961 2015 .46 .42

23 260A 1874 2015 .65 .64 .51 .49 .50 .53

24 260B 1870 2015 .60 .58 .51 .58 .62 .49

25 265A 1960 2015 .39 .43

26 265B 1961 2015 .46 .46

27 282A 1943 2015 .62 .44 .57

28 282B 1942 2014 .63 .57 .68

Av segment correlation .62 .50 .49 .53 .44 .43

PART 6: POTENTIAL PROBLEMS: ACRU\_VMC1235\_CORR3 11:26 Tue 25 Jul 2017 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

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

242A 1917 to 2015 99 years Series 1

[B] Entire series, effect on correlation ( .577) is:

Lower 1999< -.034 1996< -.024 1978< -.013 1982> -.010 1917> -.010 1922> -.009 Higher 1949 .066 1954 .019

242A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 124 85 75

1920 61 85 88 76 71 66 71 59 41 33

1930 33 36 45 43 46 47 34 31 24 61

1940 90 60 71 74 85 64 89 118 100 19

1950 23 74 92 164 71 147 130 135 106 129

1960 129 191 227 170 203 184 135 132 169 205

1970 313 304 352 294 230 269 215 232 162 179

1980 188 272 225 181 218 231 187 184 182 222

1990 179 173 211 185 174 179 99 156 121 83

2000 129 139 94 131 87 95 74 60 96 94

2010 95 77 58 69 53 62

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

242B 1915 to 2006 92 years Series 2

[B] Entire series, effect on correlation ( .402) is:

Lower 1937> -.053 1925< -.038 1988< -.026 1943< -.023 1990< -.022 1980< -.015 Higher 1954 .050 1949 .039

242B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 133 172 178 145 134

1920 113 162 138 195 173 115 180 153 125 101

1930 88 131 163 195 177 156 135 133 82 89

1940 119 72 52 35 63 66 113 118 143 40

1950 16 61 84 71 29 84 127 154 128 168

1960 133 157 187 182 186 208 142 151 209 277

1970 264 238 242 219 183 209 179 198 165 207

1980 140 206 157 104 117 117 85 112 54 99

1990 62 74 83 74 66 66 27 35 27 22

2000 47 32 21 48 29 23 19

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

243B 1877 to 2015 139 years Series 3

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

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

1900 1949 0 .12 -.08 -.04 .14 .11 .03 -.08 -.27 -.03 .11 .28\* .20 -.01 .00 -.11 -.06 -.21 -.16 -.07 .20 .12

1925 1974 9 .02 .19 .11 .00 .14 .11 .11 -.19 -.15 -.10 .20| .14 -.10 .02 -.12 -.30 -.08 -.11 .05 .30\*-.06

1950 1999 -4 -.15 -.06 .01 .07 .10 .37 .39\* .00 -.21 -.16 .28| .14 -.26 -.21 -.01 -.15 .00 -.12 -.09 .29 -.15

1966 2015 -5 -.08 -.17 .11 .16 -.14 .27\* .26 .01 -.11 -.08 .20| - - - - - - - - - -

[B] Entire series, effect on correlation ( .303) is:

Lower 1949> -.041 1895< -.027 1983> -.020 1896> -.013 1966> -.013 1889> -.012 Higher 1891 .041 1954 .033

1900 to 1949 segment:

Lower 1949> -.130 1939< -.016 1914< -.012 1926< -.012 1900> -.011 1920> -.009 Higher 1928 .049 1905 .031

1925 to 1974 segment:

Lower 1949> -.120 1966> -.035 1960< -.035 1970< -.017 1939< -.014 1968< -.013 Higher 1954 .130 1928 .052

1950 to 1999 segment:

Lower 1983> -.078 1966> -.049 1960< -.034 1970< -.019 1996> -.019 1950> -.018 Higher 1954 .131 1974 .041

1966 to 2015 segment:

Lower 1983> -.079 1966> -.049 2004> -.034 2002> -.024 1970< -.021 1996> -.019 Higher 1987 .062 1974 .053

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

1949 +3.2 SD

243B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1877 243 344 229

1880 224 166 133 104 134 133 132 150 114 124

1890 170 106 85 104 150 88 135 179 169 129

1900 206 213 208 168 206 218 170 136 95 108

1910 110 118 93 78 65 61 82 80 84 59

1920 76 92 83 89 95 107 90 107 68 67

1930 99 119 130 154 105 93 48 51 47 41

1940 49 75 72 100 122 118 93 84 99 152

1950 136 215 191 128 44 54 58 67 64 141

1960 70 113 186 152 207 212 233 227 183 194

1970 173 156 188 194 144 253 292 274 237 233

1980 246 287 193 220 184 189 160 78 77 65

1990 63 92 73 72 55 51 68 77 73 64

2000 50 48 60 54 79 73 63 69 88 84

2010 83 83 76 91 71 69

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

247A 1876 to 2015 140 years Series 4

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

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

1950 1999 -9 .03 .33\* .16 -.12 -.13 .27 .24 -.16 -.31 -.18 .25|-.03 -.20 -.23 .04 .00 .07 .05 .15 .15 -.06

1966 2015 0 .16 .21 .24 -.11 -.08 .16 .14 -.24 -.17 -.20 .24\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .455) is:

Lower 1983> -.017 1967> -.016 1903< -.015 1878< -.013 1877> -.013 1982> -.010 Higher 1890 .017 1889 .015

1950 to 1999 segment:

Lower 1983> -.057 1967> -.055 1982> -.032 1962< -.028 1975< -.025 1976< -.022 Higher 1954 .059 1987 .044

1966 to 2015 segment:

Lower 1983> -.060 1967> -.057 1982> -.033 1975< -.027 1976< -.024 2007> -.019 Higher 1987 .055 1966 .031

[D] 4 Absent rings: Year Master N series Absent

1928 -1.594 9 1

1929 -1.600 9 1

1937 -2.222 9 1

1938 -1.617 10 1

247A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1876 228 238 163 80

1880 210 141 149 116 161 165 198 195 224 140

1890 285 177 191 190 164 147 117 203 175 172

1900 160 192 189 103 151 187 157 127 109 121

1910 154 204 160 172 177 139 171 182 145 118

1920 132 146 94 121 87 113 62 24 0 0

1930 7 25 22 8 6 20 8 0 0 43

1940 36 49 86 128 121 150 195 264 285 163

1950 130 299 274 249 144 206 208 178 131 141

1960 105 117 98 94 119 127 103 202 195 169

1970 204 153 171 174 166 100 87 105 81 213

1980 270 350 333 339 387 437 352 54 123 195

1990 241 220 174 168 138 170 98 240 255 301

2000 283 298 210 226 241 248 198 215 225 224

2010 204 201 149 155 123 110

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247B 1899 to 2015 117 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

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

1950 1999 -9 -.05 .41\* .10 -.30 -.08 .31 .24 -.09 -.14 -.08 .26|-.15 -.25 .06 .07 .00 .05 -.02 -.02 -.12 -.29

1966 2015 -8 -.06 .21 .23\*-.23 .01 .19 .15 -.08 .09 -.13 .14| - - - - - - - - - -

[B] Entire series, effect on correlation ( .349) is:

Lower 1983> -.028 1991< -.023 1974> -.022 1928> -.017 1936> -.016 1921< -.014 Higher 1937 .049 1903 .022

1950 to 1999 segment:

Lower 1983> -.070 1974> -.055 1991< -.050 1970< -.024 1968< -.020 1967> -.018 Higher 1954 .060 1981 .032

1966 to 2015 segment:

Lower 1983> -.071 1974> -.058 2007> -.034 1991< -.030 1970< -.024 1968< -.020 Higher 1966 .043 1981 .043

247B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1899 229

1900 212 151 123 79 108 130 90 85 97 81

1910 99 138 92 79 77 83 92 66 53 48

1920 28 34 47 79 92 138 141 122 116 90

1930 92 133 107 136 95 115 146 59 103 126

1940 94 88 110 117 111 105 103 138 138 98

1950 79 159 212 203 107 196 241 200 126 111

1960 69 95 122 77 109 123 77 117 82 68

1970 69 90 115 159 193 183 168 171 141 134

1980 100 170 123 136 91 116 117 82 76 81

1990 106 46 46 84 88 80 51 117 116 104

2000 91 117 127 152 133 213 245 338 385 361

2010 323 415 224 207 75 205

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

248A 1960 to 2015 56 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

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

1960 2009 0 .12 .00 .15 .14 .03 -.04 .22 -.06 .03 -.09 .27\*-.08 .03 -.13 -.29 -.12 -.31 - - - -

1966 2015 0 .09 .04 .29 .03 .08 -.10 .14 -.03 .06 -.07 .32\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .307) is:

Lower 2004< -.037 2000> -.028 1963> -.024 1993< -.023 1975< -.016 1989< -.014 Higher 1974 .034 2006 .026

1960 to 2009 segment:

Lower 2004< -.037 2000> -.029 1993< -.026 1963> -.025 1975< -.018 1989< -.016 Higher 1974 .038 2006 .029

1966 to 2015 segment:

Lower 2004< -.045 2000> -.031 1993< -.024 1975< -.017 1988> -.015 1989< -.015 Higher 1974 .034 2006 .026

248A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 167 94 169 167 122 136 102 103 122 164

1970 131 121 124 133 86 90 116 169 199 294

1980 349 369 289 256 336 311 228 245 281 198

1990 280 226 273 222 251 275 237 267 267 330

2000 349 287 260 282 180 231 173 230 240 247

2010 236 312 261 306 249 230

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248B 1960 to 2015 56 years Series 7

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

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

1960 2009 0 -.11 -.14 .09 .19 .11 -.04 .04 .09 .05 -.18 .32\* .03 .16 -.11 -.09 .03 -.14 - - - -

[B] Entire series, effect on correlation ( .353) is:

Lower 1989< -.055 1983> -.041 1970< -.039 1987> -.024 1993< -.022 1972< -.020 Higher 1982 .074 1974 .037

1960 to 2009 segment:

Lower 1989< -.057 1983> -.043 1970< -.042 1987> -.026 1993< -.024 1972< -.021 Higher 1982 .084 1974 .040

248B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 254 157 186 136 115 146 124 105 117 128

1970 100 127 109 141 90 174 246 215 351 406

1980 390 457 267 265 319 263 227 259 258 185

1990 248 240 224 187 198 229 222 294 234 234

2000 208 156 107 127 72 98 99 123 164 204

2010 191 213 181 204 163 163

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249A 1948 to 2015 68 years Series 8

[B] Entire series, effect on correlation ( .423) is:

Lower 1949> -.085 2003< -.026 2014> -.022 1970< -.019 1996> -.009 2011< -.007 Higher 1954 .114 1950 .022

249A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1948 303 356

1950 121 199 273 857 283 256 366 267 370 265

1960 387 350 442 301 336 363 227 185 145 51

1970 58 60 82 82 48 115 151 170 133 197

1980 164 137 60 27 33 41 48 47 57 79

1990 144 66 78 85 72 75 69 75 46 40

2000 43 42 30 20 24 26 26 19 28 34

2010 37 34 53 49 62 66

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249B 1959 to 2015 57 years Series 9

[B] Entire series, effect on correlation ( .550) is:

Lower 1967> -.027 1973< -.023 2007> -.021 1969< -.021 1982> -.020 2003< -.017 Higher 1983 .098 1966 .040

249B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 270

1960 356 301 373 246 417 409 232 341 404 212

1970 368 411 340 269 190 266 409 356 295 422

1980 409 391 300 113 200 225 212 215 256 304

1990 326 272 196 187 215 205 185 256 206 207

2000 164 132 80 76 67 92 122 157 166 185

2010 201 203 221 217 152 144

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

249C 1962 to 2015 54 years Series 10

[B] Entire series, effect on correlation ( .523) is:

Lower 1969< -.082 2006> -.028 1967> -.027 2001< -.027 2003< -.025 1996> -.017 Higher 1966 .048 1983 .040

249C Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 492 333 456 544 315 401 384 204

1970 373 383 343 297 227 262 388 375 281 363

1980 373 356 177 83 134 164 135 114 109 169

1990 230 192 149 173 167 199 183 223 141 149

2000 127 80 77 62 70 111 138 131 130 148

2010 177 143 129 138 93 110

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

250A 1941 to 2014 74 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

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

1965 2014 0 -.08 -.08 -.11 -.29 -.03 -.06 .18 -.01 .15 -.01 .31\* .11 - - - - - - - - -

[B] Entire series, effect on correlation ( .385) is:

Lower 2006< -.058 1948< -.022 1950> -.020 2009< -.020 2014> -.015 1954> -.012 Higher 1949 .105 1952 .017

1965 to 2014 segment:

Lower 2006< -.048 2009< -.030 2014> -.024 2013< -.016 2002> -.015 1997< -.013 Higher 1973 .021 2010 .020

250A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 140 152 190 168 166 161 153 124 82

1950 153 163 245 200 184 218 209 186 301 303

1960 319 235 240 210 238 210 205 164 178 175

1970 252 249 286 354 241 246 301 238 159 142

1980 134 130 102 105 104 117 98 82 110 105

1990 181 152 148 177 148 233 178 124 140 139

2000 112 149 149 170 142 143 62 101 110 93

2010 141 122 139 119 129

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

250B 1950 to 2015 66 years Series 12

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

Lower 1966> -.041 1961< -.022 2008< -.021 1965< -.018 1960< -.016 1959< -.016 Higher 1954 .039 1974 .019

250B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 126 178 286 280 189 181 233 218 272 228

1960 208 192 294 282 323 271 316 298 375 300

1970 441 399 495 486 316 422 434 371 360 304

1980 262 267 197 179 176 179 162 169 151 197

1990 290 269 293 295 251 338 276 284 200 251

2000 185 196 137 183 160 182 126 93 61 119

2010 182 215 211 138 51 56

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

251A 1882 to 2015 134 years Series 13

[B] Entire series, effect on correlation ( .433) is:

Lower 2012< -.023 1922< -.015 1917< -.014 1989< -.011 1896> -.010 1889> -.007 Higher 1937 .031 1891 .022

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

2012 .590 27 1 >> WARNING: Ring is not usually narrow

251A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1882 261 132 183 137 147 176 137 154

1890 192 134 159 164 246 216 208 230 214 220

1900 179 226 182 162 245 241 169 148 141 191

1910 159 137 106 126 124 114 121 77 76 77

1920 63 85 59 86 73 112 96 110 90 90

1930 104 98 128 115 134 130 129 92 105 134

1940 140 136 134 191 157 164 136 139 186 135

1950 96 153 192 149 125 169 171 155 143 172

1960 151 136 121 57 68 67 61 53 93 86

1970 78 66 54 78 53 49 118 173 80 139

1980 137 109 85 58 78 89 68 39 54 32

1990 40 48 48 50 37 29 22 32 34 31

2000 31 20 8 8 7 12 12 16 17 24

2010 13 22 0 32 16 18

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

251B 1886 to 2015 130 years Series 14

[B] Entire series, effect on correlation ( .529) is:

Lower 1903> -.019 1978< -.018 1954> -.018 1919> -.011 2010< -.010 2003< -.008 Higher 1891 .041 1949 .032

251B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 138 181 136 133

1890 191 113 152 185 211 200 156 169 147 143

1900 139 144 128 131 172 166 118 113 89 118

1910 122 113 89 92 72 49 47 33 38 64

1920 70 99 74 93 79 76 75 53 47 48

1930 74 84 86 86 87 83 83 50 61 86

1940 78 88 127 161 134 113 120 131 156 96

1950 116 170 196 180 153 175 183 163 127 132

1960 116 88 84 43 49 58 45 27 42 31

1970 43 36 33 59 40 43 73 88 31 60

1980 66 49 26 18 32 35 27 12 24 23

1990 23 44 31 46 39 33 31 37 46 46

2000 47 36 16 9 15 19 16 7 8 18

2010 12 20 16 24 19 18

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

252A 1941 to 2015 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

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

1966 2015 0 -.25 -.18 .31 -.20 -.09 -.07 -.03 .01 -.04 -.33 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .464) is:

Lower 1996> -.021 1983> -.021 1991< -.020 1980< -.020 1987> -.017 1950> -.015 Higher 1949 .094 1954 .046

1966 to 2015 segment:

Lower 1996> -.033 1980< -.029 1983> -.029 1987> -.027 2015> -.019 1991< -.019 Higher 1982 .089 1974 .048

252A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 160 203 228 199 200 217 184 241 134

1950 183 194 351 247 120 121 175 205 259 275

1960 289 336 330 306 346 301 250 259 239 262

1970 340 257 294 289 166 169 205 158 138 158

1980 122 145 89 110 144 107 73 114 124 117

1990 160 64 96 85 61 71 116 114 82 97

2000 48 33 39 54 59 87 61 34 30 36

2010 44 46 26 29 30 37

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252B 1938 to 2015 78 years Series 16

[B] Entire series, effect on correlation ( .492) is:

Lower 2011< -.026 1938< -.022 1955< -.020 1983> -.017 1963> -.013 1992< -.012 Higher 1954 .053 1982 .029

252B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 71 198

1940 237 161 198 243 226 235 223 195 144 108

1950 142 148 254 217 118 99 131 168 178 223

1960 224 227 266 259 217 204 180 178 205 208

1970 271 209 227 225 140 182 175 144 142 153

1980 119 128 49 58 50 37 24 31 22 45

1990 41 14 10 33 16 23 24 21 28 25

2000 22 15 12 21 26 46 32 19 18 24

2010 31 21 26 24 23 30

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253A 1972 to 2014 43 years Series 17

[B] Entire series, effect on correlation ( .309) is:

Lower 2011< -.061 1995< -.046 1976< -.037 1997< -.030 1978> -.023 1987> -.019 Higher 1983 .171 1981 .038

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

2011 1.175 27 2 >> WARNING: Ring is not usually narrow

253A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1972 357 326 271 228 192 244 362 244

1980 193 281 174 89 126 111 71 98 88 126

1990 72 74 94 73 63 21 24 11 10 16

2000 15 8 6 16 8 5 8 6 7 29

2010 28 0 32 38 17

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253B 1957 to 2014 58 years Series 18

[B] Entire series, effect on correlation ( .322) is:

Lower 1987> -.045 2007> -.043 2014> -.029 1979< -.023 1958< -.021 1990< -.021 Higher 1983 .182 1981 .028

[D] 4 Absent rings: Year Master N series Absent

2003 .017 28 1 >> WARNING: Ring is not usually narrow

2005 .301 28 1 >> WARNING: Ring is not usually narrow

2006 -.760 28 1

2011 1.175 27 2 >> WARNING: Ring is not usually narrow

253B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 131 98 206

1960 309 229 237 224 183 203 200 205 283 271

1970 344 308 328 400 272 287 250 222 308 217

1980 206 320 226 123 219 200 155 210 134 148

1990 101 96 111 118 97 37 29 13 17 20

2000 16 16 10 0 17 0 0 17 9 18

2010 15 0 17 17 18

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254A 1943 to 2015 73 years Series 19

[B] Entire series, effect on correlation ( .612) is:

Lower 1945< -.045 1946< -.015 1950> -.013 1979< -.012 2013< -.009 2003< -.007 Higher 1954 .066 1983 .021

254A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 208 213 110 82 130 134 89

1950 105 104 136 205 120 153 195 177 249 220

1960 193 174 191 140 138 104 100 86 115 187

1970 243 328 311 385 254 280 290 234 284 201

1980 242 215 140 90 85 120 127 109 76 130

1990 140 143 165 165 149 170 148 141 135 153

2000 109 125 118 98 76 103 66 68 109 188

2010 218 160 109 93 69 55

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254B 1944 to 2014 71 years Series 20

[B] Entire series, effect on correlation ( .443) is:

Lower 1951< -.051 2002> -.025 1954> -.024 1969> -.015 1959< -.015 1946< -.014 Higher 1949 .078 1982 .013

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

1950 1951 -4.2 SD

254B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 211 209 144 199 217 117

1950 126 78 164 196 162 172 234 194 209 142

1960 175 125 151 154 186 155 162 122 147 328

1970 312 386 364 377 225 270 273 230 275 202

1980 203 161 114 102 113 132 146 55 56 83

1990 129 114 147 125 84 109 76 73 88 118

2000 72 111 154 188 159 172 81 60 83 94

2010 122 96 118 132 108

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255A 1956 to 2015 60 years Series 21

[B] Entire series, effect on correlation ( .316) is:

Lower 1956< -.083 1987> -.046 2007> -.039 1983> -.026 1986> -.021 1981< -.018 Higher 1982 .086 1966 .031

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

1987 +3.1 SD

255A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 80 155 183 161

1960 228 225 235 218 193 216 168 152 224 271

1970 305 294 325 365 248 246 280 266 233 215

1980 248 217 149 186 197 223 249 276 227 198

1990 204 211 232 242 212 190 197 199 171 225

2000 225 290 227 243 242 271 240 306 287 294

2010 332 294 301 283 263 209

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255B 1961 to 2015 55 years Series 22

[B] Entire series, effect on correlation ( .391) is:

Lower 2011< -.043 2014> -.036 1987> -.025 1974> -.022 1986> -.021 1989< -.018 Higher 1982 .060 1966 .056

255B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 285 252 216 196 276 205 210 306 312

1970 361 356 288 264 259 284 244 260 234 206

1980 262 253 179 170 151 177 213 212 170 144

1990 160 191 228 244 233 197 179 197 164 252

2000 215 282 198 253 269 277 216 204 212 228

2010 290 236 252 308 343 307

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260A 1874 to 2015 142 years Series 23

[B] Entire series, effect on correlation ( .564) is:

Lower 1937> -.025 1960< -.012 1982> -.012 1932< -.010 1938> -.008 1879> -.008 Higher 1883 .033 1949 .021

260A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1874 261 261 218 183 205 190

1880 186 166 186 99 122 112 162 141 146 90

1890 174 107 141 111 109 142 81 164 163 131

1900 119 126 137 106 121 178 172 147 115 108

1910 141 164 144 113 125 118 131 148 119 117

1920 154 176 176 195 144 213 193 106 51 76

1930 97 101 63 71 73 73 59 73 84 60

1940 67 59 85 72 68 74 117 125 141 55

1950 65 156 108 94 56 116 94 97 105 117

1960 88 91 122 132 144 167 143 154 207 157

1970 186 171 169 195 161 185 207 254 226 267

1980 279 220 209 96 97 144 147 122 107 156

1990 194 170 125 116 104 79 54 70 127 151

2000 133 206 153 211 122 143 118 56 73 93

2010 135 92 113 182 82 74

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260B 1870 to 2015 146 years Series 24

[\*] Early part of series cannot be checked from 1870 to 1873 -- not matched by another series

[B] Entire series, effect on correlation ( .554) is:

Lower 1937> -.022 1877< -.013 1938> -.011 1879> -.011 1944< -.010 1906> -.010 Higher 1949 .035 1883 .032

260B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1870 194 213 192 213 227 219 207 133 181 170

1880 176 139 137 97 122 111 143 138 152 91

1890 153 116 151 128 141 151 123 183 205 146

1900 133 137 163 140 164 203 211 175 127 113

1910 135 172 127 121 115 105 122 123 84 79

1920 114 121 111 120 76 127 108 60 27 46

1930 45 61 50 57 52 115 50 60 84 92

1940 86 68 53 46 33 75 109 108 119 40

1950 65 117 112 131 81 121 112 147 148 153

1960 141 148 159 143 164 229 162 188 273 197

1970 212 142 164 255 126 172 179 213 117 141

1980 163 126 105 74 62 96 63 31 34 46

1990 103 116 79 142 87 55 34 37 59 62

2000 26 65 57 106 67 57 73 38 63 61

2010 74 69 78 103 75 47

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265A 1960 to 2015 56 years Series 25

[B] Entire series, effect on correlation ( .432) is:

Lower 1996> -.037 1967< -.036 1999< -.024 1982> -.023 2002> -.022 1993< -.020 Higher 1983 .098 1966 .029

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

1967 -4.6 SD

265A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 324 303 311 278 332 333 266 196 331 347

1970 406 360 426 395 391 397 447 392 472 483

1980 528 514 459 318 454 444 365 417 467 471

1990 455 403 404 337 421 504 541 346 400 254

2000 275 295 337 280 209 210 220 108 244 262

2010 296 359 210 279 138 179

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265B 1961 to 2015 55 years Series 26

[B] Entire series, effect on correlation ( .460) is:

Lower 2006> -.037 1999< -.035 1982> -.024 1997< -.023 1974> -.020 1988> -.018 Higher 1983 .127 1970 .018

265B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 392 475 432 418 398 421 338 680 669

1970 733 531 601 563 531 506 539 531 479 443

1980 535 529 451 249 323 287 281 314 375 372

1990 377 336 340 377 293 290 256 187 210 156

2000 139 200 203 220 229 266 293 156 245 219

2010 196 376 213 188 101 163

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282A 1943 to 2015 73 years Series 27

[B] Entire series, effect on correlation ( .570) is:

Lower 1954> -.064 1996> -.021 1965< -.019 1963> -.016 1974> -.015 1979< -.013 Higher 1949 .110 1966 .021

282A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 241 200 204 225 223 204 106

1950 114 133 239 232 245 223 282 246 332 352

1960 334 312 318 363 340 274 241 307 363 350

1970 479 389 430 437 398 407 394 417 343 281

1980 292 345 249 215 253 227 253 232 203 279

1990 317 256 268 252 209 361 356 300 231 307

2000 171 226 177 182 174 145 121 79 150 160

2010 143 230 200 191 156 77

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282B 1942 to 2014 73 years Series 28

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

Lower 1994< -.036 1954> -.034 1948< -.021 1963> -.017 1988> -.011 1982> -.009 Higher 1983 .039 1966 .023

282B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 129 152 170 176 226 207 132 94

1950 93 115 169 182 166 165 218 186 256 289

1960 282 255 258 300 305 253 203 209 288 258

1970 337 304 396 335 294 282 297 276 272 265

1980 256 302 253 197 225 256 189 164 203 231

1990 250 194 158 184 114 138 95 133 145 156

2000 114 186 137 151 94 106 77 59 62 80

2010 89 136 93 126 70

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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 242A 1917 2015 99 4 0 .577 1.27 3.52 .741 .879 .237 2.50 .470 .025 1

2 242B 1915 2006 92 4 0 .402 1.22 2.77 .632 .849 .292 2.61 .458 -.028 1

3 243B 1877 2015 139 5 4 .303 1.25 3.44 .639 .847 .203 2.69 .484 -.008 1

4 247A 1876 2015 140 5 2 .455 1.62 4.37 .826 .781 .314 2.73 .355 -.038 1

5 247B 1899 2015 117 5 2 .349 1.27 4.15 .683 .794 .258 2.51 .337 -.046 1

6 248A 1960 2015 56 2 2 .307 2.21 3.69 .761 .798 .192 2.52 .433 -.028 2

7 248B 1960 2015 56 2 1 .353 1.98 4.57 .821 .806 .204 2.75 .570 -.196 1

8 249A 1948 2015 68 3 0 .423 1.45 8.57 1.460 .683 .300 2.93 .420 -.052 1

9 249B 1959 2015 57 2 0 .550 2.48 4.22 .981 .697 .227 2.45 .449 -.006 1

10 249C 1962 2015 54 2 0 .523 2.20 5.44 1.215 .808 .234 2.45 .488 -.057 1

11 250A 1941 2014 74 3 1 .385 1.72 3.54 .621 .780 .181 2.51 .343 -.026 1

12 250B 1950 2015 66 2 0 .620 2.43 4.95 .986 .821 .205 2.77 .682 -.087 1

13 251A 1882 2015 134 5 0 .433 1.09 2.61 .624 .871 .250 2.63 .470 -.014 1

14 251B 1886 2015 130 5 0 .529 .82 2.11 .537 .916 .244 2.55 .400 -.029 1

15 252A 1941 2015 75 3 1 .464 1.57 3.51 .942 .879 .237 2.67 .550 -.042 2

16 252B 1938 2015 78 3 0 .492 1.17 2.71 .875 .918 .259 2.81 .527 .019 1

17 253A 1972 2014 43 1 0 .309 .99 3.62 1.069 .914 .452 2.80 .580 .009 1

18 253B 1957 2014 58 2 0 .322 1.46 4.00 1.152 .902 .439 2.48 .394 -.010 1

19 254A 1943 2015 73 3 0 .612 1.57 3.85 .686 .796 .223 2.61 .483 -.030 1

20 254B 1944 2014 71 3 0 .443 1.60 3.86 .752 .792 .245 2.46 .441 -.009 1

21 255A 1956 2015 60 2 0 .316 2.34 3.65 .511 .706 .136 2.57 .497 .006 1

22 255B 1961 2015 55 2 0 .391 2.38 3.61 .515 .658 .147 2.63 .682 .014 1

23 260A 1874 2015 142 6 0 .564 1.34 2.79 .501 .709 .231 2.59 .404 -.012 1

24 260B 1870 2015 146 6 0 .554 1.18 2.73 .536 .775 .265 2.67 .478 -.030 1

25 265A 1960 2015 56 2 0 .432 3.50 5.41 1.016 .737 .184 2.38 .408 .019 1

26 265B 1961 2015 55 2 0 .460 3.57 7.33 1.518 .844 .181 2.70 .427 -.027 1

27 282A 1943 2015 73 3 0 .570 2.60 4.79 .903 .818 .179 2.61 .426 .065 1

28 282B 1942 2014 73 3 0 .595 1.95 3.96 .785 .866 .190 2.84 .622 .080 1

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Total or mean: 2340 90 13 .461 1.64 8.57 .777 .811 .241 2.93 .462 -.019

- = [ COFECHA ACRU COF ] = -