[] Dendrochronology Program Library Run 141AS Program COF 13:11 Thu 07 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 27857

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: 141\_ASC\_Corr2-30

File of DATED series: 141\_ASC\_corr2

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 1929 to 2010 82 years

Continuous time span is 1929 to 2010 82 years

Portion with two or more series is 1933 to 2010 78 years

>> 174-a 1973 absent in 1 of 20 series, but is not usually narrow: master index is -.278

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

\*C\* Number of dated series 20 \*C\*

\*O\* Master series 1929 2010 82 yrs \*O\*

\*F\* Total rings in all series 1385 \*F\*

\*E\* Total dated rings checked 1381 \*E\*

\*C\* Series intercorrelation .592 \*C\*

\*H\* Average mean sensitivity .210 \*H\*

\*A\* Segments, possible problems 20 \*A\*

\*\*\* Mean length of series 69.3 \*\*\*

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

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

174-a 1 absent rings: 1973

174-b 1 absent rings: 1968

2 absent rings .144%

PART 2: TIME PLOT OF TREE-RING SERIES: 141\_ASC\_Corr2-30 13:11 Thu 07 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

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

. . . . . . . . . . . . . . . . . . <=======> . 171-a 1 1938 2010 73

. . . . . . . . . . . . . . . . . . <======> . 171-b 2 1942 2010 69

. . . . . . . . . . . . . . . . . . <=======> . 172-a 3 1939 2010 72

. . . . . . . . . . . . . . . . . . <=======> . 172-b 4 1938 2010 73

. . . . . . . . . . . . . . . . . . <======> . 173-a 5 1942 2010 69

. . . . . . . . . . . . . . . . . . <======> . 173-b 6 1940 2010 71

. . . . . . . . . . . . . . . . . . <========> . 174-a 7 1929 2010 82

. . . . . . . . . . . . . . . . . . <=======> . 174-b 8 1937 2010 74

. . . . . . . . . . . . . . . . . . <=====> . 175-a 9 1950 2010 61

. . . . . . . . . . . . . . . . . . <======> . 175-b 10 1949 2010 62

. . . . . . . . . . . . . . . . . . <======> . 176-a 11 1947 2010 64

. . . . . . . . . . . . . . . . . . <======> . 176-b 12 1946 2010 65

. . . . . . . . . . . . . . . . . . <======> . 177-a 13 1942 2010 69

. . . . . . . . . . . . . . . . . . <======> . 177-b 14 1943 2010 68

. . . . . . . . . . . . . . . . . . <======> . 178-a 15 1941 2010 70

. . . . . . . . . . . . . . . . . . <=======> . 178-b 16 1933 2010 78

. . . . . . . . . . . . . . . . . . <======> . 179-a 17 1946 2010 65

. . . . . . . . . . . . . . . . . . <=====> . 179-b 18 1952 2010 59

. . . . . . . . . . . . . . . . . . <======> . 180-a 19 1942 2010 69

. . . . . . . . . . . . . . . . . . <=======> . 180-b 20 1939 2010 72

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

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: 141\_ASC\_Corr2-30 13:11 Thu 07 Apr 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

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

1950 -.177 19 2000 -1.777 20

1951 -.297 19 2001 -.441 20

1952 .279 20 2002 -.013 20

1953 -1.678 20 2003 -2.835 20

1954 .264 20 2004 -.164 20

1955 .495 20 2005 .154 20

1956 -1.470 20 2006 -.608 20

1957 .547 20 2007 1.498 20

1958 .743 20 2008 .691 20

1959 .719 20 2009 .601 20

1960 -.562 20 2010 1.533 20

1961 1.521 20

1962 .718 20

1963 .491 20

1964 -.151 20

1965 -.293 20

1966 -1.569 20

1967 -1.513 20

1968 -2.236 20 1

1969 -1.521 20

1970 -.471 20

1971 .298 20

1972 -.079 20

1973 -.278 20 1<<

1974 -.145 20

1975 .796 20

1976 .977 20

1977 .808 20

1978 .038 20

1929 -2.055 1 1979 1.350 20

1930 -.980 1 1980 .890 20

1931 1.081 1 1981 -.704 20

1932 1.556 1 1982 .488 20

1933 -.391 2 1983 -.147 20

1934 -1.845 2 1984 -.551 20

1935 .487 2 1985 .767 20

1936 -.487 2 1986 .207 20

1937 .785 3 1987 1.562 20

1938 .073 5 1988 .350 20

1939 -.824 7 1989 .786 20

1940 -.275 8 1990 1.242 20

1941 .459 9 1991 -.463 20

1942 .012 13 1992 1.165 20

1943 -.831 14 1993 .635 20

1944 .826 14 1994 -.278 20

1945 1.620 14 1995 1.287 20

1946 .131 16 1996 -1.456 20

1947 .972 17 1997 -1.600 20

1948 .152 17 1998 -.944 20

1949 1.028 18 1999 -.970 20

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PART 4: Master Bar Plot: 141\_ASC\_Corr2-30 13:11 Thu 07 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

1950----a 2000g

1951---a 2001--b

1952------A 2002----@

1953g 2003k

1954------A 2004----a

1955-------B 2005-----A

1956-f 2006--b

1957-------B 2007----------F

1958--------C 2008-------C

1959--------C 2009-------B

1960--b 2010----------F

1961----------F

1962--------C

1963------B

1964----a

1965---a

1966-f

1967-f

1968i

1969-f

1970--b

1971------A

1972----@

1973---a

1974----a

1975--------C

1976---------D

1977--------C

1978-----@

1929h 1979----------E

1930--d 1980--------D

1931---------D 1981--c

1932----------F 1982------B

1933---b 1983----a

1934g 1984--b

1935------B 1985--------C

1936--b 1986-----A

1937--------C 1987----------F

1938-----@ 1988------A

1939--c 1989--------C

1940---a 1990---------E

1941------B 1991--b

1942-----@ 1992---------E

1943--c 1993-------C

1944--------C 1994---a

1945----------F 1995---------E

1946-----A 1996-f

1947---------D 1997-f

1948-----A 1998--d

1949---------D 1999--d

PART 5: CORRELATION OF SERIES BY SEGMENTS: 141\_ASC\_Corr2-30 13:11 Thu 07 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 1920 1935 1950 1965 1980 1995

1949 1964 1979 1994 2009 2024

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

1 171-a 1938 2010 .76 .79 .69 .80 .83

2 171-b 1942 2010 .51 .69 .74 .81 .80

3 172-a 1939 2010 .46 .30B .34B .73 .75

4 172-b 1938 2010 .40A .42A .60 .56 .59B

5 173-a 1942 2010 .55 .55 .41A .75 .76

6 173-b 1940 2010 .66 .74 .51 .66 .67

7 174-a 1929 2010 .53 .60 .69 .57 .36B .39B

8 174-b 1937 2010 .55 .64 .36B .37A .39A

9 175-a 1950 2010 .70 .61 .74 .72

10 175-b 1949 2010 .69 .66 .59 .71 .68

11 176-a 1947 2010 .65 .67 .70 .90 .90

12 176-b 1946 2010 .54 .57 .44B .59 .61

13 177-a 1942 2010 .62 .70 .67 .75 .76

14 177-b 1943 2010 .47 .50 .52 .78 .79

15 178-a 1941 2010 .48 .43 .57 .72 .72

16 178-b 1933 2010 .33A .39A .40A .50 .68 .70

17 179-a 1946 2010 .35A .18B .29A .72 .73

18 179-b 1952 2010 .49 .61 .62 .62

19 180-a 1942 2010 .65 .69 .64 .77 .77

20 180-b 1939 2010 .41A .56 .54B .65 .65

Av segment correlation .43 .54 .57 .54 .68 .69

PART 6: POTENTIAL PROBLEMS: 141\_ASC\_Corr2-30 13:11 Thu 07 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

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

171-a 1938 to 2010 73 years Series 1

[B] Entire series, effect on correlation ( .778) is:

Lower 1980< -.012 1940> -.012 1953> -.011 1988> -.010 2006> -.010 1994> -.008 Higher 1996 .021 2003 .021

171-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 275 259

1940 297 290 296 237 280 293 246 263 202 216

1950 177 148 145 125 160 158 99 177 168 142

1960 108 141 100 82 86 63 45 44 33 35

1970 54 76 82 90 101 131 143 150 155 144

1980 113 100 114 120 100 118 97 175 165 182

1990 164 108 140 105 113 138 71 69 80 83

2000 51 61 77 43 81 82 100 127 144 131

2010 179

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

171-b 1942 to 2010 69 years Series 2

[B] Entire series, effect on correlation ( .679) is:

Lower 1948< -.042 1951> -.019 1942> -.017 1956> -.014 1943> -.013 2006> -.012 Higher 2003 .081 1953 .019

171-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 347 309 303 313 249 265 180 233

1950 210 253 183 140 157 177 138 205 183 151

1960 111 160 131 92 83 78 52 56 43 63

1970 94 122 125 162 198 259 248 264 239 254

1980 216 184 211 178 172 197 150 275 220 231

1990 238 145 220 161 178 182 136 135 170 146

2000 161 177 187 119 181 183 228 311 296 287

2010 287

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

172-a 1939 to 2010 72 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

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

1950 1979 8 .28 .01 .00 .28 .08 -.08 .37 -.12 -.21 -.25 .30|-.37 -.40 -.14 .05 -.28 .18 .04 .40\* .04 .20

1965 1994 -8 .41 -.12 .44\* .20 .24 .06 .14 .10 -.31 -.19 .34|-.54 -.03 -.03 -.35 .17 -.11 -.21 .00 -.13 -.09

[B] Entire series, effect on correlation ( .524) is:

Lower 1960< -.017 1966> -.014 2000> -.014 1953> -.013 1952< -.012 1978< -.011 Higher 1996 .038 2003 .031

1950 to 1979 segment:

Lower 1966> -.037 1953> -.034 1968> -.027 1951> -.024 1965> -.021 1969> -.021 Higher 1956 .108 1960 .075

1965 to 1994 segment:

Lower 1966> -.033 1965> -.032 1974< -.032 1978< -.025 1969> -.024 1976< -.024 Higher 1981 .052 1987 .049

172-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 176

1940 206 224 148 120 181 210 147 170 150 185

1950 144 157 107 104 116 98 59 83 92 90

1960 41 95 119 114 113 133 108 96 87 101

1970 90 112 74 72 62 75 79 81 60 96

1980 110 90 137 147 114 134 129 160 131 146

1990 176 137 144 166 130 146 88 98 99 85

2000 99 91 102 67 69 73 82 97 115 110

2010 180

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

172-b 1938 to 2010 73 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

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

1938 1967 0 - -.11 -.14 .37 -.04 -.16 .33 -.05 -.07 -.13 .40\*-.27 -.06 -.06 .12 -.19 .16 .11 .09 .00 .07

1950 1979 0 .30 -.02 -.22 .21 -.15 -.14 .31 -.27 -.08 -.11 .42\*-.31 -.13 .11 .15 -.03 .22 .07 .34 -.19 .14

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

1981 2010 -3 .02 -.07 .20 -.18 .04 .35 -.30 .59\* .12 -.12 .59| - - - - - - - - - -

[B] Entire series, effect on correlation ( .456) is:

Lower 1960< -.042 1978< -.025 1943> -.013 1951> -.012 1953> -.011 1955< -.010 Higher 1956 .017 1981 .013

1938 to 1967 segment:

Lower 1960< -.043 1953> -.040 1943> -.035 1951> -.027 1955< -.019 1948> -.017 Higher 1945 .037 1956 .034

1950 to 1979 segment:

Lower 1953> -.047 1978< -.032 1951> -.026 1955< -.017 1950> -.010 1972> -.006 Higher 1956 .026 1975 .023

1981 to 2010 segment:

Lower 1999< -.057 2001< -.038 1982< -.018 2005< -.016 1998> -.014 1997> -.010 Higher 2010 .024 2003 .022

172-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 270 190

1940 178 208 189 264 300 366 270 302 313 316

1950 280 309 264 224 228 178 139 160 157 198

1960 91 128 114 106 106 114 87 88 79 84

1970 88 105 108 84 85 116 109 97 63 92

1980 92 73 80 83 94 117 103 109 97 107

1990 121 104 119 121 108 111 89 89 103 68

2000 74 64 73 64 82 79 71 108 109 118

2010 163

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

173-a 1942 to 2010 69 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

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

1965 1994 0 .03 -.12 .19 .14 -.01 -.25 .06 .29 .16 .03 .41\* .14 .21 .21 -.26 -.03 -.03 -.04 -.11 -.18 .01

[B] Entire series, effect on correlation ( .628) is:

Lower 1942> -.026 1976< -.021 2000> -.014 1945< -.013 1991> -.013 1988> -.012 Higher 2003 .092 1996 .018

1965 to 1994 segment:

Lower 1976< -.063 1988> -.040 1991> -.039 1975< -.032 1984> -.030 1978> -.027 Higher 1981 .089 1966 .069

173-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 314 242 256 234 219 266 190 245

1950 198 162 196 161 191 222 163 230 243 193

1960 185 238 245 210 160 162 93 86 78 73

1970 74 81 73 83 79 72 60 122 114 145

1980 98 72 98 108 121 114 132 142 144 131

1990 122 124 135 116 108 143 104 105 122 124

2000 142 155 146 96 164 196 143 346 290 308

2010 320

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173-b 1940 to 2010 71 years Series 6

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

Lower 1990< -.051 1993< -.026 1997> -.020 1945< -.014 1999> -.011 1964> -.008 Higher 2003 .086 1956 .020

173-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 298 315 250 167 188 180 153 182 153 177

1950 132 153 202 151 205 226 128 186 200 160

1960 133 170 202 222 212 184 128 109 83 69

1970 85 108 89 89 96 115 129 119 122 180

1980 145 86 112 104 81 101 105 129 102 98

1990 62 64 79 56 60 81 59 78 93 104

2000 89 84 94 54 91 114 111 146 174 174

2010 235

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

174-a 1929 to 2010 82 years Series 7

[\*] Early part of series cannot be checked from 1929 to 1932 -- 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

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

1980 2009 -3 .32 .21 .01 .05 .23 -.05 -.17 .63\*-.07 -.09 .36|-.31 - - - - - - - - -

1981 2010 -3 .22 .20 .03 -.11 .24 -.04 -.20 .66\*-.05 -.10 .39| - - - - - - - - - -

[B] Entire series, effect on correlation ( .439) is:

Lower 2006< -.050 1973< -.031 1933> -.023 2003> -.012 1996> -.011 1985< -.009 Higher 1945 .017 2010 .014

1980 to 2009 segment:

Lower 2006< -.165 1996> -.018 1985< -.017 1982< -.017 1994> -.016 2003> -.013 Higher 1995 .028 1997 .026

1981 to 2010 segment:

Lower 2006< -.161 1996> -.019 1985< -.018 1982< -.017 2003> -.016 1994> -.016 Higher 2010 .034 1997 .025

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

1973 -.278 20 1 >> WARNING: Ring is not usually narrow

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

2006 -5.5 SD

174-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 142

1930 156 194 210 202 146 205 162 204 193 151

1940 180 202 216 196 225 323 245 190 109 196

1950 132 95 101 81 128 98 64 72 79 83

1960 72 109 96 89 95 66 35 29 18 21

1970 33 51 62 0 60 56 117 147 121 137

1980 137 97 78 88 92 87 93 137 106 118

1990 127 103 143 199 168 173 130 88 102 91

2000 95 112 106 87 121 94 43 84 102 96

2010 145

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174-b 1937 to 2010 74 years Series 8

[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 8 .02 -.21 -.14 .24 -.16 .38 -.07 -.06 .38 -.19 .36|-.06 -.09 .32 -.42 .21 -.15 -.30 .45\*-.30 .29

1980 2009 0 .16 -.06 -.12 -.03 .07 .17 -.17 .35 .03 -.38 .37\*-.17 - - - - - - - - -

1981 2010 0 .08 -.06 -.10 -.15 .09 .16 -.20 .39 .05 -.39 .39\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .483) is:

Lower 1986< -.044 2003> -.024 1994> -.015 1988< -.014 1981> -.013 1942> -.013 Higher 1968 .028 1996 .018

1965 to 1994 segment:

Lower 1986< -.085 1981> -.054 1994> -.049 1991> -.023 1984> -.019 1988< -.014 Higher 1968 .119 1966 .031

1980 to 2009 segment:

Lower 1986< -.083 2003> -.033 1994> -.027 1981> -.024 1988< -.023 1984> -.010 Higher 1996 .045 1987 .027

1981 to 2010 segment:

Lower 1986< -.082 2003> -.036 1994> -.026 1981> -.024 1988< -.023 1984> -.010 Higher 1996 .042 2010 .029

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

1968 -2.236 20 1

174-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 202 179 176

1940 165 209 244 213 243 201 148 177 130 143

1950 109 81 73 72 150 130 99 102 111 118

1960 73 100 85 81 74 52 29 19 0 16

1970 36 56 67 46 53 60 83 128 112 120

1980 125 117 139 110 118 111 75 114 81 115

1990 133 115 128 103 118 119 91 79 86 75

2000 74 97 89 83 133 160 102 102 100 89

2010 139

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175-a 1950 to 2010 61 years Series 9

[B] Entire series, effect on correlation ( .707) is:

Lower 1996> -.029 1960> -.023 1982< -.012 2010< -.011 1968> -.010 2006> -.010 Higher 2003 .056 1956 .013

175-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 136 126 171 99 148 153 109 153 177 201

1960 192 271 216 167 143 134 91 118 121 142

1970 167 147 133 167 159 221 296 314 254 307

1980 255 197 180 147 161 197 252 261 188 222

1990 216 177 214 170 185 209 176 143 161 154

2000 132 167 168 136 190 176 188 217 193 216

2010 198

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

175-b 1949 to 2010 62 years Series 10

[B] Entire series, effect on correlation ( .646) is:

Lower 1960> -.032 1968> -.014 2006> -.013 2010< -.012 1994> -.010 1956< -.009 Higher 1953 .026 1961 .014

175-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1949 156

1950 125 106 129 77 101 123 48 119 140 144

1960 164 220 156 127 80 94 51 77 90 113

1970 120 136 134 110 137 138 178 199 171 155

1980 148 105 110 89 95 121 147 180 141 162

1990 145 107 112 103 114 122 96 96 102 87

2000 73 95 130 110 141 155 176 214 224 200

2010 197

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

176-a 1947 to 2010 64 years Series 11

[B] Entire series, effect on correlation ( .744) is:

Lower 1969< -.039 1960> -.032 1948> -.016 1947< -.015 1979< -.008 1978> -.008 Higher 2003 .034 1996 .021

176-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 232 279 267

1950 206 232 275 188 250 226 174 225 208 185

1960 214 253 208 218 183 192 141 129 105 93

1970 154 194 194 184 189 231 244 227 241 218

1980 232 174 203 181 200 265 252 302 225 231

1990 280 195 196 184 164 193 109 100 91 109

2000 83 156 147 81 108 128 124 197 161 152

2010 192

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

176-b 1946 to 2010 65 years Series 12

[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 -3 .13 -.10 .14 -.06 .21 .11 .09 .48\* .26 .27 .44|-.16 .17 -.05 -.21 .23 -.21 -.16 .07 .08 -.09

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

Lower 2000< -.042 1981> -.021 1960> -.017 1987< -.016 1976< -.011 1948> -.011 Higher 2003 .034 1996 .034

1965 to 1994 segment:

Lower 1981> -.071 1987< -.054 1976< -.039 1984> -.028 1975< -.025 1978> -.024 Higher 1968 .081 1979 .042

176-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 96 189 298 314

1950 224 266 310 202 252 245 162 206 195 175

1960 182 254 152 167 131 155 114 104 85 71

1970 100 147 116 123 119 127 123 181 200 238

1980 264 219 217 168 200 221 174 158 159 163

1990 209 161 158 154 121 159 95 99 119 118

2000 53 148 168 88 136 136 121 170 117 178

2010 310

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

177-a 1942 to 2010 69 years Series 13

[B] Entire series, effect on correlation ( .696) is:

Lower 1942< -.027 1956> -.020 2006> -.012 1959< -.010 1948> -.008 1982< -.008 Higher 2003 .078 1968 .012

177-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 27 58 132 180 138 165 193 166

1950 158 163 255 151 266 273 220 287 253 188

1960 162 206 179 164 145 147 120 150 92 132

1970 175 161 194 179 157 227 210 263 206 220

1980 171 117 121 101 88 114 120 116 118 109

1990 121 83 101 109 77 105 76 76 64 82

2000 73 109 99 64 103 106 115 127 109 119

2010 148

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

177-b 1943 to 2010 68 years Series 14

[B] Entire series, effect on correlation ( .624) is:

Lower 1960> -.038 1968> -.022 1949< -.017 1998< -.013 1943< -.012 1948> -.012 Higher 2003 .076 1996 .029

177-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 65 144 205 178 184 230 167

1950 163 171 224 135 272 262 224 284 280 295

1960 348 321 355 275 190 216 159 200 250 292

1970 275 259 282 277 195 276 254 175 171 200

1980 171 126 178 174 128 154 125 171 142 125

1990 126 85 86 113 102 103 58 60 50 70

2000 83 107 112 64 133 140 122 133 152 186

2010 211

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

178-a 1941 to 2010 70 years Series 15

[B] Entire series, effect on correlation ( .578) is:

Lower 2004< -.020 1951< -.019 1977< -.019 1952< -.016 1974> -.014 2006> -.011 Higher 1996 .049 2003 .029

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

1974 +3.3 SD

178-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 230 193 225 229 337 269 312 270 310

1950 262 100 72 51 65 60 54 62 67 86

1960 30 56 29 36 36 29 24 24 17 25

1970 38 72 61 55 116 78 88 60 63 87

1980 112 97 121 104 102 125 99 122 96 108

1990 87 85 126 106 73 91 51 58 56 65

2000 56 63 77 50 50 64 79 119 105 111

2010 118

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

178-b 1933 to 2010 78 years Series 16

[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 0 - - - - - - .19 -.15 -.07 -.28 .33\*-.22 -.11 .00 .10 .08 .09 .20 .30 -.03 .05

1935 1964 0 - - - - -.11 .00 .14 -.15 -.03 -.26 .39\*-.38 -.07 -.06 .12 .06 .05 .20 .34 -.05 .03

1950 1979 0 .28 .15 -.19 .20 -.03 -.12 .22 -.22 -.22 -.25 .40\*-.25 -.10 .00 .29 -.08 .19 .22 .37 -.03 -.11

[B] Entire series, effect on correlation ( .436) is:

Lower 1960< -.076 1934> -.016 1933< -.015 2004< -.012 1936> -.012 1977< -.011 Higher 1996 .027 1953 .017

1933 to 1962 segment:

Lower 1960< -.062 1934> -.037 1936> -.024 1933< -.023 1939> -.020 1950> -.019 Higher 1953 .034 1945 .026

1935 to 1964 segment:

Lower 1960< -.070 1936> -.037 1939> -.029 1950> -.025 1952< -.013 1940> -.012 Higher 1953 .036 1945 .025

1950 to 1979 segment:

Lower 1960< -.068 1950> -.034 1967> -.025 1969> -.025 1977< -.017 1952< -.012 Higher 1953 .025 1957 .019

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

1959 1960 -4.2 SD

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

1960 -7.0 SD

178-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 140 158 219 232 323 314 300

1940 332 263 232 205 237 297 251 298 177 221

1950 232 198 133 89 110 120 81 96 81 71

1960 13 39 30 32 29 23 18 27 24 35

1970 39 46 41 29 44 60 67 46 42 59

1980 101 91 153 115 116 163 139 139 110 98

1990 112 74 77 75 63 89 54 59 58 64

2000 55 62 68 56 50 79 87 148 109 144

2010 205

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

179-a 1946 to 2010 65 years Series 17

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

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

1946 1975 0 -.17 .08 -.16 -.23 -.12 -.01 -.29 .17 -.16 .13 .35\* .13 .20 -.05 -.07 -.02 -.29 -.14 -.20 .08 -.14

1950 1979 -9 -.02 .28\*-.01 -.20 -.18 .00 -.16 .10 -.25 -.07 .18| .14 -.10 -.04 .16 -.13 -.11 -.04 -.23 .04 -.29

1965 1994 0 .08 .16 .09 -.01 -.28 .00 -.11 .12 -.24 -.20 .29\* .01 -.17 .12 -.06 -.01 .08 -.02 -.20 -.02 -.23

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

Lower 1977< -.134 1960> -.032 1985< -.028 1950> -.010 1957< -.008 1969> -.008 Higher 1996 .045 2003 .021

1946 to 1975 segment:

Lower 1960> -.087 1951< -.048 1957< -.032 1954< -.031 1952< -.029 1950> -.023 Higher 1956 .088 1953 .085

1950 to 1979 segment:

Lower 1977< -.224 1960> -.061 1950> -.018 1969> -.014 1954< -.012 1957< -.012 Higher 1979 .061 1956 .059

1965 to 1994 segment:

Lower 1977< -.269 1985< -.062 1969> -.021 1968> -.019 1966> -.008 1988> -.005 Higher 1979 .055 1981 .043

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

1977 -4.6 SD

179-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 249 266 264 250

1950 257 82 73 47 75 105 61 90 163 185

1960 228 265 203 190 197 146 143 132 143 172

1970 221 194 174 156 153 151 150 104 117 170

1980 154 119 131 114 91 86 105 132 119 126

1990 133 103 135 128 99 125 77 82 88 112

2000 79 77 95 77 166 174 128 212 158 138

2010 211

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179-b 1952 to 2010 59 years Series 18

[B] Entire series, effect on correlation ( .555) is:

Lower 1988< -.056 1960> -.043 1954< -.025 2001< -.017 1969> -.016 1955< -.008 Higher 2007 .022 1996 .019

179-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 260 108 75 106 97 181 199 258

1960 285 276 249 218 191 146 156 141 154 237

1970 247 239 193 209 196 234 212 187 172 202

1980 182 165 192 176 176 201 157 165 131 148

1990 174 139 190 168 135 186 145 162 182 159

2000 153 160 200 182 251 236 233 365 280 273

2010 289

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180-a 1942 to 2010 69 years Series 19

[B] Entire series, effect on correlation ( .675) is:

Lower 1951> -.022 1942< -.017 1968< -.016 2006> -.014 1966> -.011 2000> -.010 Higher 1996 .019 1953 .018

180-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 198 206 263 287 247 267 241 206

1950 171 239 258 164 178 186 129 174 144 131

1960 88 128 94 81 56 50 50 33 8 13

1970 22 27 27 43 41 54 50 69 43 62

1980 47 44 57 49 48 90 77 81 84 77

1990 82 67 109 95 73 106 71 64 69 82

2000 93 94 112 88 118 164 164 195 160 144

2010 154

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180-b 1939 to 2010 72 years Series 20

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

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

1939 1968 0 -.11 -.23 -.06 .02 .08 -.26 .14 -.05 .16 .00 .41\* .02 .05 .30 -.15 -.37 .05 -.36 -.16 -.30 .25

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

1965 1994 -3 -.07 -.38 .05 -.24 .08 .08 -.13 .65\*-.11 .08 .54|-.28 .47 .12 -.17 .20 -.04 .07 -.10 .31 .04

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

Lower 1940< -.065 1994< -.027 1960> -.022 1989< -.014 1971< -.012 1996> -.011 Higher 2003 .064 1968 .015

1939 to 1968 segment:

Lower 1940< -.206 1960> -.049 1966> -.019 1946> -.014 1948> -.012 1950< -.007 Higher 1968 .052 1961 .050

1965 to 1994 segment:

Lower 1994< -.061 1966> -.054 1989< -.038 1971< -.032 1981> -.027 1983> -.021 Higher 1968 .047 1992 .031

180-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 202

1940 147 201 215 222 301 296 289 314 295 310

1950 209 221 232 197 230 291 209 244 206 185

1960 206 273 191 188 95 90 99 59 23 28

1970 35 34 47 70 99 157 163 179 129 175

1980 152 126 185 191 106 202 168 168 131 105

1990 148 112 176 160 95 144 126 95 122 140

2000 142 191 182 137 195 217 176 243 233 255

2010 254

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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 ()

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

1 171-a 1938 2010 73 5 0 .778 1.36 2.97 .689 .905 .195 2.65 .542 -.059 2

2 171-b 1942 2010 69 5 0 .679 1.88 3.47 .695 .813 .192 2.55 .436 -.037 2

3 172-a 1939 2010 72 5 2 .524 1.17 2.24 .391 .720 .198 2.52 .438 -.045 1

4 172-b 1938 2010 73 5 3 .456 1.40 3.66 .766 .918 .153 2.44 .360 -.108 1

5 173-a 1942 2010 69 5 1 .628 1.60 3.45 .697 .809 .177 2.64 .457 -.014 2

6 173-b 1940 2010 71 5 0 .668 1.35 3.15 .573 .823 .202 2.57 .397 -.052 1

7 174-a 1929 2010 82 6 2 .439 1.20 3.23 .583 .813 .278 2.63 .414 -.029 1

8 174-b 1937 2010 74 5 3 .483 1.09 2.44 .493 .852 .259 2.64 .555 -.012 1

9 175-a 1950 2010 61 4 0 .707 1.82 3.14 .488 .705 .177 2.55 .472 -.103 2

10 175-b 1949 2010 62 5 0 .646 1.29 2.24 .395 .724 .202 2.51 .431 -.094 1

11 176-a 1947 2010 64 5 0 .744 1.90 3.02 .537 .721 .180 2.57 .630 .017 1

12 176-b 1946 2010 65 5 1 .577 1.69 3.14 .603 .650 .233 2.58 .412 -.047 1

13 177-a 1942 2010 69 5 0 .696 1.45 2.87 .575 .769 .213 2.44 .415 -.038 2

14 177-b 1943 2010 68 5 0 .624 1.80 3.55 .758 .828 .208 2.52 .560 -.051 1

15 178-a 1941 2010 70 5 0 .578 1.01 3.37 .743 .893 .244 2.82 .533 .031 2

16 178-b 1933 2010 78 6 3 .436 1.17 3.32 .849 .921 .238 2.41 .322 -.070 1

17 179-a 1946 2010 65 5 3 .460 1.44 2.66 .558 .738 .213 2.61 .445 .031 1

18 179-b 1952 2010 59 4 0 .555 1.93 3.65 .538 .674 .170 2.96 .547 .023 1

19 180-a 1942 2010 69 5 0 .675 1.11 2.87 .707 .923 .221 2.62 .475 .052 1

20 180-b 1939 2010 72 5 2 .550 1.73 3.14 .714 .820 .224 2.54 .546 -.067 1

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Total or mean: 1385 100 20 .592 1.46 3.66 .622 .805 .210 2.96 .467 -.034

- = [ COFECHA 141ASCOF ] = -