[] Dendrochronology Program Library Run 164 Program COF 10:00 Tue 22 Mar 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27841

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 164\_HUB

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 1915 to 2010 96 years

Continuous time span is 1915 to 2010 96 years

Portion with two or more series is 1925 to 2010 86 years

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

\*C\* Number of dated series 10 \*C\*

\*O\* Master series 1915 2010 96 yrs \*O\*

\*F\* Total rings in all series 734 \*F\*

\*E\* Total dated rings checked 724 \*E\*

\*C\* Series intercorrelation .625 \*C\*

\*H\* Average mean sensitivity .283 \*H\*

\*A\* Segments, possible problems 1 \*A\*

\*\*\* Mean length of series 73.4 \*\*\*

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

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

No ring measurements of zero value

PART 2: TIME PLOT OF TREE-RING SERIES: 10:00 Tue 22 Mar 2011 Page 2

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

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

. . . . . . . . . . . . . . . . . . <=====> . 116A 1 1950 2010 61

. . . . . . . . . . . . . . . . . . <=====> . 116B 2 1957 2010 54

. . . . . . . . . . . . . . . . . .<=========> . 117A 3 1915 2010 96

. . . . . . . . . . . . . . . . . . <========> . 117B 4 1925 2010 86

. . . . . . . . . . . . . . . . . . <======> . 118A 5 1945 2010 66

. . . . . . . . . . . . . . . . . . <========> . 118B 6 1928 2010 83

. . . . . . . . . . . . . . . . . . <========> . 119A 7 1926 2010 85

. . . . . . . . . . . . . . . . . . <=====> . 119B 8 1952 2010 59

. . . . . . . . . . . . . . . . . . <========> . 589A 9 1928 2010 83

. . . . . . . . . . . . . . . . . . <=====> . 589B 10 1950 2010 61

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

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: 10:00 Tue 22 Mar 2011 Page 3

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

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1950 -.441 8 2000 -1.222 10

1951 1.466 8 2001 -.401 10

1952 .080 9 2002 .402 10

1953 -.911 9 2003 -2.280 10

1954 1.210 9 2004 -.789 10

1955 .150 9 2005 -.664 10

1956 .999 9 2006 .114 10

1957 1.503 10 2007 .333 10

1958 1.010 10 2008 .674 10

1959 .417 10 2009 1.058 10

1960 -.095 10 2010 1.183 10

1961 .664 10

1962 -1.466 10

1963 -1.560 10

1964 -.566 10

1915 -.752 1 1965 -.244 10

1916 -.494 1 1966 -.797 10

1917 .099 1 1967 .457 10

1918 -.422 1 1968 .049 10

1919 -2.443 1 1969 .388 10

1920 -1.215 1 1970 .208 10

1921 .966 1 1971 .675 10

1922 -1.281 1 1972 .304 10

1923 .481 1 1973 .236 10

1924 .831 1 1974 1.297 10

1925 1.277 2 1975 1.055 10

1926 1.689 3 1976 1.433 10

1927 1.318 3 1977 .414 10

1928 .536 5 1978 -.456 10

1929 .534 5 1979 .480 10

1930 .037 5 1980 .666 10

1931 .288 5 1981 -.940 10

1932 .770 5 1982 -2.123 10

1933 .028 5 1983 -1.835 10

1934 -.215 5 1984 -1.747 10

1935 .429 5 1985 -.849 10

1936 -.268 5 1986 -.625 10

1937 -.379 5 1987 .539 10

1938 .000 5 1988 .104 10

1939 -2.184 5 1989 .365 10

1940 -2.986 5 1990 .749 10

1941 -1.892 5 1991 1.061 10

1942 -1.461 5 1992 2.066 10

1943 .170 5 1993 1.331 10

1944 -.110 5 1994 .685 10

1945 .761 6 1995 .201 10

1946 -.075 6 1996 -.233 10

1947 .788 6 1997 .162 10

1948 -.612 6 1998 -.212 10

1949 .299 6 1999 -.246 10

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PART 4: Master Bar Plot: 10:00 Tue 22 Mar 2011 Page 4

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

1950--b 2000-e

1951----------F 2001---b

1952----@ 2002------B

1953--d 2003i

1954---------E 2004--c

1955-----A 2005--c

1956---------D 2006-----@

1957----------F 2007------A

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

1959------B 2009---------D

1960----@ 2010---------E

1961--------C

1962-f

1963-f

1964--b

1915--c 1965---a

1916--b 1966--c

1917-----@ 1967-------B

1918---b 1968----@

1919j 1969------B

1920-e 1970-----A

1921---------D 1971--------C

1922-e 1972------A

1923-------B 1973-----A

1924--------C 1974----------E

1925----------E 1975---------D

1926----------G 1976----------F

1927----------E 1977------B

1928-------B 1978--b

1929-------B 1979-------B

1930----@ 1980--------C

1931------A 1981-d

1932--------C 1982h

1933----@ 1983g

1934---a 1984g

1935-------B 1985--c

1936---a 1986--c

1937---b 1987-------B

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

1939i 1989------A

1940l 1990--------C

1941h 1991---------D

1942-f 1992----------H

1943-----A 1993----------E

1944----@ 1994--------C

1945--------C 1995-----A

1946----@ 1996---a

1947--------C 1997-----A

1948--b 1998---a

1949------A 1999---a

PART 5: CORRELATION OF SERIES BY SEGMENTS: 10:00 Tue 22 Mar 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 116A 1950 2010 .56 .50 .69 .69

2 116B 1957 2010 .55 .57 .76 .75

3 117A 1915 2010 .66 .74 .76 .67 .74 .72

4 117B 1925 2010 .58 .64 .62 .73 .76 .75

5 118A 1945 2010 .74 .64 .50B .51 .50

6 118B 1928 2010 .54 .61 .53 .53 .69 .70

7 119A 1926 2010 .66 .71 .70 .65 .44 .45

8 119B 1952 2010 .49 .57 .75 .76

9 589A 1928 2010 .53 .63 .64 .71 .60 .59

10 589B 1950 2010 .65 .70 .76 .76

Av segment correlation .59 .68 .61 .61 .67 .67

PART 6: POTENTIAL PROBLEMS: 10:00 Tue 22 Mar 2011 Page 5

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

[A] Correlations with master dating series of flagged 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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116A 1950 to 2010 61 years Series 1

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

Lower 1978< -.061 1952> -.025 2004< -.022 1968> -.011 1991< -.010 1994> -.010 Higher 2003 .041 1962 .024

116A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 161 219 208 145 230 156 218 194 181 178

1960 132 218 117 120 125 166 121 140 170 194

1970 168 149 156 140 190 138 175 135 73 100

1980 120 94 86 75 77 119 116 167 101 162

1990 152 131 193 183 210 160 137 153 120 149

2000 116 179 235 90 84 75 138 165 238 308

2010 307

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

116B 1957 to 2010 54 years Series 2

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

Lower 1961< -.047 1982> -.037 1975< -.022 1989> -.011 1986> -.009 1978< -.009 Higher 2003 .096 1992 .017

116B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 318 318 250

1960 193 110 63 69 83 94 100 185 159 164

1970 160 174 187 159 219 157 202 137 82 105

1980 111 77 84 73 57 86 117 171 127 189

1990 158 142 210 205 185 157 139 143 104 113

2000 66 78 115 49 58 94 209 251 242 390

2010 365

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117A 1915 to 2010 96 years Series 3

[\*] Early part of series cannot be checked from 1915 to 1924 -- not matched by another series

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

Lower 1945< -.030 1953> -.017 1989< -.011 2007> -.009 1986< -.009 1944> -.008 Higher 2003 .048 1939 .033

117A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 52 59 73 70 48

1920 65 124 68 120 139 144 195 214 157 164

1930 134 130 123 121 114 96 68 58 77 12

1940 8 24 19 75 113 71 71 102 72 152

1950 128 195 164 181 224 177 211 244 220 208

1960 162 161 111 101 118 139 107 141 126 118

1970 96 100 78 79 121 84 73 48 34 57

1980 57 34 8 24 21 48 25 69 90 57

1990 85 149 155 109 89 93 93 119 135 140

2000 136 154 196 131 196 198 222 369 412 428

2010 388

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117B 1925 to 2010 86 years Series 4

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

Lower 1944< -.044 1962> -.020 1927< -.016 1937> -.013 1996< -.012 1932< -.011 Higher 2003 .069 1939 .043

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

1944 -5.3 SD

117B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 178 164 110 102 71

1930 57 74 55 49 43 53 48 59 56 16

1940 12 17 18 34 10 52 48 72 35 89

1950 77 127 101 74 100 98 123 142 123 103

1960 112 110 92 75 89 67 64 86 65 61

1970 65 87 58 70 110 79 65 55 42 65

1980 55 25 6 15 13 19 32 40 49 33

1990 51 85 98 75 75 83 53 85 105 102

2000 100 98 126 93 130 172 200 179 196 212

2010 297

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118A 1945 to 2010 66 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 1 -.41 -.25 -.18 -.09 -.10 -.17 .18 .17 .03 .20 .50| .51\* .17 .09 .12 -.03 -.31 -.17 -.31 -.03 -.35

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

Lower 2009< -.039 1978> -.032 1969< -.026 2000< -.026 2004> -.009 1988> -.009 Higher 1962 .031 1981 .021

1965 to 1994 segment:

Lower 1978> -.093 1969< -.084 1988> -.026 1984> -.018 1972> -.015 1989< -.011 Higher 1981 .102 1992 .045

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

2000 -5.1 SD

118A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 386 282 356 264 256

1950 220 289 254 203 265 226 253 341 331 285

1960 228 229 142 112 144 168 145 199 163 111

1970 130 157 172 161 158 175 195 116 156 128

1980 122 42 48 42 75 67 75 131 178 128

1990 152 221 257 216 165 150 145 163 149 151

2000 58 142 175 126 255 298 269 342 377 273

2010 298

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118B 1928 to 2010 83 years Series 6

[B] Entire series, effect on correlation ( .561) is:

Lower 1939> -.037 1938< -.021 2000< -.018 1978> -.016 1971< -.014 2009< -.011 Higher 2003 .067 1951 .019

118B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 125 208

1930 127 215 226 101 108 118 76 65 28 34

1940 20 16 23 63 69 76 52 140 101 123

1950 98 313 155 103 134 131 156 224 200 182

1960 138 125 94 88 86 83 106 119 85 69

1970 62 55 90 84 109 96 114 85 85 62

1980 66 34 27 28 39 33 44 93 72 77

1990 72 130 170 124 102 69 61 95 121 124

2000 56 105 158 96 214 253 216 282 338 292

2010 394

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119A 1926 to 2010 85 years Series 7

[B] Entire series, effect on correlation ( .571) is:

Lower 2000> -.037 1959< -.023 1996> -.017 1946> -.016 2006< -.016 1972< -.016 Higher 1939 .051 1962 .033

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

1938 +3.2 SD; 2000 +4.5 SD

119A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 77 79 43 52

1930 57 41 91 73 43 80 42 58 152 53

1940 31 40 63 138 165 225 233 175 153 172

1950 144 282 182 159 285 237 230 243 254 153

1960 164 193 122 128 155 159 170 177 165 207

1970 181 221 133 125 155 208 266 187 131 190

1980 212 133 70 67 87 146 126 138 137 129

1990 325 272 361 269 173 170 336 310 176 303

2000 358 230 216 124 136 127 83 141 251 385

2010 446

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119B 1952 to 2010 59 years Series 8

[B] Entire series, effect on correlation ( .649) is:

Lower 1955< -.043 1963> -.025 1981> -.024 1968< -.018 1967< -.018 1994< -.016 Higher 2003 .065 1982 .027

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

1963 +3.4 SD

119B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 195 181 286 165 273 380 282 233

1960 196 274 184 222 222 196 163 148 116 151

1970 147 228 155 149 177 207 239 215 167 210

1980 180 148 80 65 64 107 113 115 121 141

1990 151 145 237 192 125 131 106 127 142 147

2000 149 192 283 192 186 213 244 319 336 441

2010 436

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589A 1928 to 2010 83 years Series 9

[B] Entire series, effect on correlation ( .583) is:

Lower 1952< -.030 2007< -.028 1928> -.024 1942> -.014 2006> -.014 1937< -.012 Higher 2003 .027 1962 .024

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

1942 +3.8 SD; 2006 +3.5 SD

589A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 89 46

1930 36 23 38 22 28 43 50 26 34 20

1940 19 61 108 134 142 203 132 174 112 131

1950 128 241 111 137 355 226 225 201 159 142

1960 142 160 105 87 134 147 153 173 175 253

1970 223 213 185 196 196 184 164 122 87 127

1980 92 22 15 18 10 9 10 23 13 48

1990 45 43 88 71 65 64 55 52 49 37

2000 52 81 113 73 98 106 281 175 191 254

2010 224

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589B 1950 to 2010 61 years Series 10

[B] Entire series, effect on correlation ( .695) is:

Lower 1966< -.040 2000> -.026 1963> -.014 1958< -.013 1953< -.010 2007< -.008 Higher 2003 .047 1962 .033

589B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 168 244 157 80 274 216 241 242 154 159

1960 148 250 124 162 168 172 90 175 182 217

1970 185 147 139 109 146 148 127 63 42 66

1980 98 41 8 15 12 13 27 62 38 51

1990 58 65 132 112 104 76 85 80 73 69

2000 103 121 135 88 151 124 234 176 203 343

2010 349

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PART 7: DESCRIPTIVE STATISTICS: 10:00 Tue 22 Mar 2011 Page 6

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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 116A 1950 2010 61 4 0 .608 1.55 3.08 .511 .547 .245 2.47 .461 .063 2

2 116B 1957 2010 54 4 0 .675 1.53 3.90 .775 .801 .254 2.63 .553 .011 1

3 117A 1915 2010 96 6 0 .719 1.23 4.28 .805 .902 .293 2.67 .464 -.036 1

4 117B 1925 2010 86 6 0 .638 .81 2.97 .507 .877 .300 2.70 .438 -.021 1

5 118A 1945 2010 66 5 1 .577 1.92 3.86 .840 .809 .238 2.52 .445 -.056 1

6 118B 1928 2010 83 6 0 .561 1.16 3.93 .751 .759 .301 2.97 .455 -.031 1

7 119A 1926 2010 85 6 0 .571 1.69 4.46 .883 .715 .304 2.60 .511 .079 1

8 119B 1952 2010 59 4 0 .649 1.93 4.41 .796 .760 .207 2.87 .624 .000 1

9 589A 1928 2010 83 6 0 .583 1.12 3.55 .769 .789 .315 2.97 .504 -.025 1

10 589B 1950 2010 61 4 0 .695 1.32 3.49 .774 .734 .333 2.77 .596 -.063 1

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Total or mean: 734 51 1 .625 1.39 4.46 .742 .778 .283 2.97 .498 -.008

- = [ COFECHA 164 COF ] = -