[] Dendrochronology Program Library Run 172\_1 Program COF 11:54 Wed 23 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 27842

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 172\_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 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 N

8 Parts printed 1234567

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

Time span of Master dating series is 1895 to 2010 116 years

Continuous time span is 1895 to 2010 116 years

Portion with two or more series is 1897 to 2010 114 years

>> 132B 2002 absent in 1 of 12 series, but is not usually narrow: master index is .403

>> 132B 2006 absent in 1 of 12 series, but is not usually narrow: master index is -.007

>> 132B 2007 absent in 1 of 12 series, but is not usually narrow: master index is .957

>> 132B 2008 absent in 1 of 12 series, but is not usually narrow: master index is 1.280

>> 132B 2009 absent in 1 of 12 series, but is not usually narrow: master index is 1.118

>> 132B 2010 absent in 1 of 12 series, but is not usually narrow: master index is 1.517

>> 879A 1972 absent in 1 of 11 series, but is not usually narrow: master index is .204

>> 879A 1973 absent in 1 of 11 series, but is not usually narrow: master index is -.394

>> 879B 1979 absent in 1 of 11 series, but is not usually narrow: master index is -.351

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

\*C\* Number of dated series 12 \*C\*

\*O\* Master series 1895 2010 116 yrs \*O\*

\*F\* Total rings in all series 1111 \*F\*

\*E\* Total dated rings checked 1109 \*E\*

\*C\* Series intercorrelation .549 \*C\*

\*H\* Average mean sensitivity .257 \*H\*

\*A\* Segments, possible problems 5 \*A\*

\*\*\* Mean length of series 92.6 \*\*\*

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

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

132B 10 absent rings: 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

879A 2 absent rings: 1972 1973

879B 2 absent rings: 1978 1979

14 absent rings 1.260%

PART 2: TIME PLOT OF TREE-RING SERIES: 11:54 Wed 23 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

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

. . . . . . . . . . . . . . . . . .<=========> . 131A 1 1915 2010 96

. . . . . . . . . . . . . . . . . . <========> . 131B 2 1923 2010 88

. . . . . . . . . . . . . . . . . . . <==> . 132A 3 1986 2010 25

. . . . . . . . . . . . . . . . . . .<====> . 132B 4 1960 2010 51

. . . . . . . . . . . . . . . . . <==========> . 133A 5 1902 2010 109

. . . . . . . . . . . . . . . . . <===========> . 133B 6 1897 2010 114

. . . . . . . . . . . . . . . . . <===========> . 134A 7 1897 2010 114

. . . . . . . . . . . . . . . . . .<=========> . 134B 8 1918 2010 93

. . . . . . . . . . . . . . . . . <===========> . 135A 9 1898 2010 113

. . . . . . . . . . . . . . . . . <===========> . 135B 10 1895 2010 116

. . . . . . . . . . . . . . . . . .<=========> . 879A 11 1917 2010 94

. . . . . . . . . . . . . . . . . .<=========> . 879B 12 1913 2010 98

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

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: 11:54 Wed 23 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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1900 .174 4 1950 .599 10 2000 -1.116 12

1901 -.353 4 1951 1.384 10 2001 -.459 12 1

1902 .884 5 1952 .457 10 2002 .403 12 1<<

1903 1.242 5 1953 .034 10 2003 -2.308 12 1

1904 -.328 5 1954 .451 10 2004 -.682 12 1

1905 -.082 5 1955 .596 10 2005 -.636 12 1

1906 -.225 5 1956 .658 10 2006 -.007 12 1<<

1907 -.681 5 1957 1.921 10 2007 .957 12 1<<

1908 -1.015 5 1958 1.959 10 2008 1.280 12 1<<

1909 -2.130 5 1959 .599 10 2009 1.118 12 1<<

1910 -.492 5 1960 -.990 11 2010 1.517 12 1<<

1911 -3.637 5 1961 .231 11

1912 -.457 5 1962 -1.597 11

1913 .703 6 1963 -.942 11

1914 -.175 6 1964 -.227 11

1915 -.032 7 1965 -.129 11

1916 .755 7 1966 -.738 11

1917 -.069 8 1967 .113 11

1918 1.551 9 1968 -.774 11

1919 .312 9 1969 -.200 11

1920 -.255 9 1970 .664 11

1921 .530 9 1971 .406 11

1922 .080 9 1972 .204 11 1<<

1923 -.039 10 1973 -.394 11 1<<

1924 1.505 10 1974 -.534 11

1925 1.376 10 1975 .162 11

1926 1.193 10 1976 .399 11

1927 1.281 10 1977 .549 11

1928 .838 10 1978 -.536 11 1

1929 .201 10 1979 -.351 11 1<<

1930 .028 10 1980 .373 11

1931 -.389 10 1981 -.669 11

1932 -.187 10 1982 -1.587 11

1933 -1.687 10 1983 -1.425 11

1934 -2.149 10 1984 -1.655 11

1935 -2.403 10 1985 -.317 11

1936 -1.640 10 1986 .169 12

1937 -1.884 10 1987 .767 12

1938 -1.437 10 1988 .958 12

1939 -.945 10 1989 .324 12

1940 -1.328 10 1990 1.002 12

1941 -.289 10 1991 1.050 12

1942 -.265 10 1992 1.324 12

1943 -.001 10 1993 1.683 12

1944 -.199 10 1994 1.054 12

1895 -.671 1 1945 .084 10 1995 .831 12

1896 1.091 1 1946 .600 10 1996 .347 12

1897 -.207 3 1947 1.164 10 1997 .277 12

1898 .572 4 1948 -.542 10 1998 .134 12

1899 .833 4 1949 .952 10 1999 -.435 12

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PART 4: Master Bar Plot: 11:54 Wed 23 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

1900-----A 1950-------B 2000-d

1901---a 1951----------F 2001--b

1902--------D 1952-------B 2002------B

1903---------E 1953-----@ 2003i

1904---a 1954-------B 2004--c

1905----@ 1955-------B 2005--c

1906----a 1956-------C 2006-----@

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

1908-d 1958----------H 2008---------E

1909i 1959-------B 2009---------D

1910--b 1960-d 2010----------F

1911o 1961------A

1912--b 1962f

1913--------C 1963-d

1914----a 1964----a

1915-----@ 1965----a

1916--------C 1966--c

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

1918----------F 1968-c

1919------A 1969----a

1920----a 1970-------C

1921-------B 1971------B

1922-----@ 1972------A

1923-----@ 1973---b

1924----------F 1974--b

1925----------F 1975-----A

1926---------E 1976------B

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

1928--------C 1978--b

1929------A 1979---a

1930-----@ 1980------A

1931---b 1981--c

1932----a 1982f

1933g 1983-f

1934i 1984g

1935j 1985---a

1936g 1986-----A

1937h 1987--------C

1938-f 1988--------D

1939-d 1989------A

1940-e 1990---------D

1941---a 1991---------D

1942---a 1992----------E

1943-----@ 1993----------G

1944----a 1994---------D

1895--c 1945-----@ 1995--------C

1896---------D 1946-------B 1996------A

1897----a 1947---------E 1997------A

1898-------B 1948--b 1998-----A

1899--------C 1949--------D 1999--b

PART 5: CORRELATION OF SERIES BY SEGMENTS: 11:54 Wed 23 Mar 2011 Page 5

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Correlations of 50-year dated segments, lagged 25 years

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

Seq Series Time\_span 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

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

1 131A 1915 2010 .71 .62 .51 .65

2 131B 1923 2010 .55 .53 .59 .57

3 132A 1986 2010 .67

4 132B 1960 2010 .33 .26A

5 133A 1902 2010 .17B .24B .46 .40

6 133B 1897 2010 .68 .80 .63 .55 .65

7 134A 1897 2010 .37B .58 .57 .56 .66

8 134B 1918 2010 .54 .51 .62 .79

9 135A 1898 2010 .63 .57 .51 .44 .63

10 135B 1895 2010 .70 .76 .61 .28B .47

11 879A 1917 2010 .72 .73 .60 .35

12 879B 1913 2010 .68 .76 .64 .46

Av segment correlation .60 .61 .57 .51 .55

PART 6: POTENTIAL PROBLEMS: 11:54 Wed 23 Mar 2011 Page 5

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

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

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

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

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

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

[D] Absent rings (zero values)

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

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131A 1915 to 2010 96 years Series 1

[B] Entire series, effect on correlation ( .661) is:

Lower 1989< -.022 1998< -.017 1960> -.017 1971> -.014 2002< -.011 2000> -.010 Higher 2003 .073 1962 .014

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

131B 1923 to 2010 88 years Series 2

[B] Entire series, effect on correlation ( .568) is:

Lower 1956< -.021 1948> -.018 1975< -.013 1971> -.012 1982> -.010 1939< -.009 Higher 1962 .019 1960 .015

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

132A 1986 to 2010 25 years Series 3

[B] Entire series, effect on correlation ( .665) is:

Lower 1995> -.057 1999> -.049 2000< -.018 1988< -.017 1986> -.014 1989< -.009 Higher 2003 .216 1993 .017

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

132B 1960 to 2010 51 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

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

1961 2010 0 -.16 .21 .20 -.18 .21 .11 .12 .08 -.05 .04 .26\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .252) is:

Lower 2001< -.044 2003> -.034 1962> -.033 1999> -.023 1966> -.017 1993< -.014 Higher 1960 .055 1981 .022

1961 to 2010 segment:

Lower 2001< -.040 1962> -.031 2003> -.024 1999> -.024 1966> -.018 1993< -.015 Higher 1982 .033 1981 .027

[D] 10 Absent rings: Year Master N series Absent

2001 -.459 12 1

2002 .403 12 1 >> WARNING: Ring is not usually narrow

2003 -2.308 12 1

2004 -.682 12 1

2005 -.636 12 1

2006 -.007 12 1 >> WARNING: Ring is not usually narrow

2007 .957 12 1 >> WARNING: Ring is not usually narrow

2008 1.280 12 1 >> WARNING: Ring is not usually narrow

2009 1.118 12 1 >> WARNING: Ring is not usually narrow

2010 1.517 12 1 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

1982 -5.0 SD

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133A 1902 to 2010 109 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

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

1902 1951 8 - - - -.09 -.03 .14 -.06 -.02 .06 -.13 .17|-.08 -.05 .01 .01 -.17 -.03 -.10 .22\*-.18 .09

1925 1974 -7 -.11 -.04 -.09 .26\* .10 -.02 -.05 .07 -.12 -.04 .24| .15 -.13 .06 .03 -.17 -.06 -.05 .24 -.23 .03

[B] Entire series, effect on correlation ( .291) is:

Lower 1911> -.025 1940< -.013 2003> -.013 1939> -.012 1902< -.009 1960> -.005 Higher 1957 .021 1978 .019

1902 to 1951 segment:

Lower 1911> -.038 1939> -.023 1902< -.013 1940< -.007 1904> -.007 1909> -.003 Higher 1918 .050 1919 .022

1925 to 1974 segment:

Lower 1939> -.029 1940< -.019 1960> -.017 1948> -.010 1962> -.010 1947< -.006 Higher 1957 .066 1959 .026

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

1939 +3.9 SD

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133B 1897 to 2010 114 years Series 6

[B] Entire series, effect on correlation ( .672) is:

Lower 1897< -.035 1955< -.018 1960> -.014 1987< -.013 1973> -.012 1907> -.012 Higher 1911 .046 1948 .018

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134A 1897 to 2010 114 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

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

1897 1946 2 - - - - - - - - -.23 .27 .37|-.14 .39\* .13 .07 .12 .13 -.15 .03 -.32 .10

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

Lower 1897> -.060 1905< -.014 1919> -.013 1965> -.011 1911> -.011 1948> -.010 Higher 2003 .069 1962 .018

1897 to 1946 segment:

Lower 1897> -.156 1905< -.038 1919> -.029 1939> -.018 1898< -.016 1899< -.014 Higher 1924 .043 1933 .035

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

1897 +4.2 SD

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134B 1918 to 2010 93 years Series 8

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

Lower 1940> -.021 1959> -.021 1952> -.018 1933> -.013 1928< -.011 1929> -.011 Higher 2003 .066 1962 .020

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135A 1898 to 2010 113 years Series 9

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

Lower 1992< -.021 1948> -.019 1918< -.015 1919> -.015 1901< -.013 1947< -.012 Higher 2003 .056 1911 .048

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135B 1895 to 2010 116 years Series 10

[\*] Early part of series cannot be checked from 1895 to 1896 -- 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

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

1950 1999 -10 .35\*-.03 -.40 -.09 .20 -.01 .35 .05 -.06 .10 .28| .05 .00 .08 -.03 -.19 .09 .06 -.18 -.01 .00

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

Lower 2006< -.041 1981> -.025 1960> -.016 1972< -.013 1988< -.013 1977< -.012 Higher 2003 .076 1911 .035

1950 to 1999 segment:

Lower 1981> -.065 1988< -.034 1977< -.031 1972< -.029 1975< -.028 1960> -.026 Higher 1962 .049 1982 .030

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879A 1917 to 2010 94 years Series 11

[B] Entire series, effect on correlation ( .518) is:

Lower 1978> -.046 1922< -.031 2003> -.030 2004< -.025 2006> -.013 1950< -.011 Higher 1962 .026 1960 .019

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

2003 2004 -4.4 SD

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

1972 .204 11 1 >> WARNING: Ring is not usually narrow

1973 -.394 11 1 >> WARNING: Ring is not usually narrow

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879B 1913 to 2010 98 years Series 12

[B] Entire series, effect on correlation ( .596) is:

Lower 1913< -.039 2003> -.037 1989> -.020 1982> -.017 1919> -.013 1940> -.013 Higher 1948 .024 1960 .020

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

1978 -.536 11 1

1979 -.351 11 1 >> WARNING: Ring is not usually narrow

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PART 7: DESCRIPTIVE STATISTICS: 11:54 Wed 23 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 131A 1915 2010 96 4 0 .661 1.05 3.05 .651 .913 .211 2.59 .433 -.041 1

2 131B 1923 2010 88 4 0 .568 1.08 2.86 .633 .884 .227 2.60 .468 -.060 1

3 132A 1986 2010 25 1 0 .665 1.79 2.79 .576 .658 .228 2.76 .675 -.080 1

4 132B 1960 2010 51 2 1 .252 1.35 4.00 .948 .840 .179 2.65 .597 -.036 1

5 133A 1902 2010 109 4 2 .291 1.33 4.00 .882 .898 .314 2.77 .389 -.063 1

6 133B 1897 2010 114 5 0 .672 1.07 2.68 .604 .841 .255 2.71 .438 -.105 1

7 134A 1897 2010 114 5 1 .533 1.50 4.11 1.050 .911 .277 2.69 .435 -.072 1

8 134B 1918 2010 93 4 0 .644 1.05 3.44 .835 .933 .276 2.54 .441 -.146 1

9 135A 1898 2010 113 5 0 .587 .88 2.80 .530 .917 .198 2.63 .344 -.078 1

10 135B 1895 2010 116 5 1 .555 .93 2.60 .605 .894 .252 2.49 .346 -.095 1

11 879A 1917 2010 94 4 0 .518 .81 2.47 .645 .916 .331 2.88 .500 -.087 1

12 879B 1913 2010 98 4 0 .596 .90 2.72 .663 .917 .282 2.60 .456 -.095 1

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Total or mean: 1111 47 5 .549 1.10 4.11 .719 .893 .257 2.88 .435 -.082

- = [ COFECHA 172\_1COF ] = -