[] Dendrochronology Program Library Run 174\_2 Program COF 12:20 Tue 05 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 27855

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 174\_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 1885 to 2010 126 years

Continuous time span is 1885 to 2010 126 years

Portion with two or more series is 1898 to 2010 113 years

>> 151B 1985 absent in 1 of 12 series, but is not usually narrow: master index is -.284

>> 151B 1987 absent in 1 of 12 series, but is not usually narrow: master index is .203

>> 151B 1988 absent in 1 of 12 series, but is not usually narrow: master index is .694

>> 151B 1989 absent in 1 of 12 series, but is not usually narrow: master index is -.249

>> 154A 1971 absent in 2 of 12 series, but is not usually narrow: master index is .511

>> 154A 2006 absent in 1 of 12 series, but is not usually narrow: master index is .636

>> 154A 2007 absent in 1 of 12 series, but is not usually narrow: master index is 1.167

>> 154A 2008 absent in 2 of 12 series, but is not usually narrow: master index is .300

>> 154A 2009 absent in 2 of 12 series, but is not usually narrow: master index is .844

>> 154A 2010 absent in 2 of 12 series, but is not usually narrow: master index is 1.178

>> 154B 1971 absent in 2 of 12 series, but is not usually narrow: master index is .511

>> 154B 2008 absent in 2 of 12 series, but is not usually narrow: master index is .300

>> 154B 2009 absent in 2 of 12 series, but is not usually narrow: master index is .844

>> 154B 2010 absent in 2 of 12 series, but is not usually narrow: master index is 1.178

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

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

\*O\* Master series 1885 2010 126 yrs \*O\*

\*F\* Total rings in all series 1005 \*F\*

\*E\* Total dated rings checked 992 \*E\*

\*C\* Series intercorrelation .577 \*C\*

\*H\* Average mean sensitivity .286 \*H\*

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

\*\*\* Mean length of series 83.8 \*\*\*

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

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

151B 8 absent rings: 1982 1983 1984 1985 1986 1987 1988 1989

154A 6 absent rings: 1971 2006 2007 2008 2009 2010

154B 6 absent rings: 1969 1971 1981 2008 2009 2010

20 absent rings 1.990%

PART 2: TIME PLOT OF TREE-RING SERIES: 12:20 Tue 05 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

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

. . . . . . . . . . . . . . . . . . <========> . 151A 1 1923 2010 88

. . . . . . . . . . . . . . . . . .<=========> . 151B 2 1919 2010 92

. . . . . . . . . . . . . . . . . . <======> . 152A 3 1946 2010 65

. . . . . . . . . . . . . . . . . . <======> . 152B 4 1942 2010 69

. . . . . . . . . . . . . . . . . . <======> . 154A 5 1940 2010 71

. . . . . . . . . . . . . . . . . <===========> . 154B 6 1898 2010 113

. . . . . . . . . . . . . . . . . .<=========> . 155A 7 1918 2010 93

. . . . . . . . . . . . . . . . . <============> . 155B 8 1885 2010 126

. . . . . . . . . . . . . . . . . . <======> . 900A 9 1943 2010 68

. . . . . . . . . . . . . . . . . . <======> . 900B 10 1940 2010 71

. . . . . . . . . . . . . . . . . . <=======> . 0277A 11 1937 2010 74

. . . . . . . . . . . . . . . . . . <=======> . 0277B 12 1936 2010 75

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

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: 12:20 Tue 05 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

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1900 .332 2 1950 -.386 12 2000 -.995 12

1901 .211 2 1951 1.266 12 2001 -.699 12

1902 .361 2 1952 -.034 12 2002 .468 12

1903 1.309 2 1953 -1.285 12 2003 -2.338 12

1904 .169 2 1954 1.051 12 2004 -1.204 12

1905 -.872 2 1955 .398 12 2005 -.240 12

1906 -1.077 2 1956 .202 12 2006 .636 12 1<<

1907 -2.251 2 1957 1.236 12 2007 1.167 12 1<<

1908 -2.129 2 1958 1.126 12 2008 .300 12 2<<

1909 -3.148 2 1959 .908 12 2009 .844 12 2<<

1910 -1.442 2 1960 -.226 12 2010 1.178 12 2<<

1911 -1.661 2 1961 .632 12

1912 -.779 2 1962 -.295 12

1913 -.302 2 1963 .414 12

1914 -.116 2 1964 -.332 12

1915 1.420 2 1965 .004 12

1916 1.180 2 1966 -.546 12

1917 .876 2 1967 -.672 12

1918 .584 3 1968 -1.423 12

1919 -.262 4 1969 -.913 12 1

1920 .030 4 1970 .112 12

1921 1.016 4 1971 .511 12 2<<

1922 -.301 4 1972 -.508 12

1923 -.229 5 1973 -.524 12

1924 1.482 5 1974 -.042 12

1925 .731 5 1975 .695 12

1926 .714 5 1976 1.766 12

1927 1.489 5 1977 .850 12

1928 .814 5 1978 -.203 12

1929 -.029 5 1979 .082 12

1930 .129 5 1980 .642 12

1931 -.333 5 1981 -.992 12 1

1932 .054 5 1982 -.709 12 1

1933 -2.079 5 1983 -1.527 12 1

1934 -2.051 5 1984 -1.517 12 1

1885 -.730 1 1935 -1.487 5 1985 -.284 12 1<<

1886 -1.661 1 1936 -.220 6 1986 -.620 12 1

1887 -.702 1 1937 -1.493 7 1987 .203 12 1<<

1888 -.884 1 1938 .475 7 1988 .694 12 1<<

1889 -1.440 1 1939 .214 7 1989 -.249 12 1<<

1890 .928 1 1940 -1.161 9 1990 1.058 12

1891 1.734 1 1941 .164 9 1991 .571 12

1892 1.383 1 1942 -.596 10 1992 1.384 12

1893 .240 1 1943 -.386 11 1993 1.627 12

1894 1.031 1 1944 -.995 11 1994 .660 12

1895 .765 1 1945 1.572 11 1995 .701 12

1896 1.798 1 1946 .040 12 1996 .054 12

1897 .766 1 1947 .615 12 1997 -.083 12

1898 1.318 2 1948 -.300 12 1998 -.051 12

1899 .781 2 1949 .414 12 1999 -.566 12

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PART 4: Master Bar Plot: 12:20 Tue 05 Apr 2011 Page 4

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

1900------A 1950---b 2000-d

1901------A 1951---------E 2001--c

1902------A 1952-----@ 2002-------B

1903---------E 1953-e 2003i

1904-----A 1954---------D 2004-e

1905--c 1955------B 2005----a

1906-d 1956------A 2006-------C

1907i 1957---------E 2007---------E

1908i 1958---------E 2008------A

1909m 1959--------D 2009--------C

1910f 1960----a 2010---------E

1911g 1961-------C

1912--c 1962---a

1913---a 1963------B

1914----@ 1964---a

1915----------F 1965-----@

1916---------E 1966--b

1917--------D 1967--c

1918-------B 1968f

1919----a 1969--d

1920-----@ 1970-----@

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

1922---a 1972---b

1923----a 1973--b

1924----------F 1974-----@

1925--------C 1975-------C

1926--------C 1976----------G

1927----------F 1977--------C

1928--------C 1978----a

1929-----@ 1979-----@

1930-----A 1980-------C

1931---a 1981-d

1932-----@ 1982--c

1933h 1983f

1934h 1984f

1885--c 1935f 1985---a

1886g 1936----a 1986--b

1887--c 1937f 1987------A

1888--d 1938-------B 1988-------C

1889f 1939------A 1989----a

1890--------D 1940-e 1990---------D

1891----------G 1941-----A 1991-------B

1892----------F 1942--b 1992----------F

1893------A 1943---b 1993----------G

1894---------D 1944-d 1994-------C

1895--------C 1945----------F 1995-------C

1896----------G 1946-----@ 1996-----@

1897--------C 1947-------B 1997----@

1898---------E 1948---a 1998-----@

1899--------C 1949------B 1999--b

PART 5: CORRELATION OF SERIES BY SEGMENTS: 12:20 Tue 05 Apr 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 151A 1923 2010 .34 .34 .35 .32A

2 151B 1919 2010 .50 .48 .46 .52

3 152A 1946 2010 .53 .52 .67

4 152B 1942 2010 .56 .52 .70

5 154A 1940 2010 .61 .63 .44

6 154B 1898 2010 .46 .47 .47 .56 .62

7 155A 1918 2010 .70 .71 .57 .66

8 155B 1885 2010 .62 .64 .62 .56 .70

9 900A 1943 2010 .59 .54 .68

10 900B 1940 2010 .47 .50 .57

11 0277A 1937 2010 .72 .65 .72

12 0277B 1936 2010 .57 .63 .70

Av segment correlation .54 .53 .56 .54 .61

PART 6: POTENTIAL PROBLEMS: 12:20 Tue 05 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 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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151A 1923 to 2010 88 years Series 1

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

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

1961 2010 0 -.20 -.09 -.24 -.01 .07 .07 .25 -.01 .22 -.03 .32\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .417) is:

Lower 1971< -.087 1988< -.052 1938< -.014 1925> -.012 1965> -.009 1969> -.008 Higher 2003 .054 1953 .022

1961 to 2010 segment:

Lower 1971< -.150 1988< -.090 1969> -.013 1965> -.012 1968> -.012 2007< -.011 Higher 2003 .133 1976 .039

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

1965 +3.7 SD; 1969 +3.2 SD; 1971 -4.9 SD

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

151B 1919 to 2010 92 years Series 2

[B] Entire series, effect on correlation ( .506) is:

Lower 1981> -.025 1939> -.019 1962> -.015 1925< -.013 1938< -.013 1988< -.011 Higher 2003 .042 1924 .017

[D] 8 Absent rings: Year Master N series Absent

1982 -.709 12 1

1983 -1.527 12 1

1984 -1.517 12 1

1985 -.284 12 1 >> WARNING: Ring is not usually narrow

1986 -.620 12 1

1987 .203 12 1 >> WARNING: Ring is not usually narrow

1988 .694 12 1 >> WARNING: Ring is not usually narrow

1989 -.249 12 1 >> WARNING: Ring is not usually narrow

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

1953 -4.5 SD; 1981 +3.0 SD

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152A 1946 to 2010 65 years Series 3

[B] Entire series, effect on correlation ( .634) is:

Lower 1962< -.073 1953> -.035 1971> -.011 1958< -.010 1965> -.009 1967> -.009 Higher 2003 .085 1981 .017

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

1962 -4.6 SD

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152B 1942 to 2010 69 years Series 4

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

Lower 1953> -.032 1974< -.024 1967> -.016 1965< -.014 1955> -.012 1972> -.012 Higher 2003 .098 1976 .014

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154A 1940 to 2010 71 years Series 5

[B] Entire series, effect on correlation ( .366) is:

Lower 2006< -.129 2003> -.037 2007< -.024 1966> -.018 1963< -.011 1979< -.007 Higher 1945 .041 1976 .025

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

2005 2006 -4.1 SD

[D] 6 Absent rings: Year Master N series Absent

1971 .511 12 2 >> WARNING: Ring is not usually narrow

2006 .636 12 1 >> WARNING: Ring is not usually narrow

2007 1.167 12 1 >> WARNING: Ring is not usually narrow

2008 .300 12 2 >> WARNING: Ring is not usually narrow

2009 .844 12 2 >> WARNING: Ring is not usually narrow

2010 1.178 12 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

1971 -5.9 SD; 2003 +4.0 SD; 2005 +3.0 SD

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154B 1898 to 2010 113 years Series 6

[B] Entire series, effect on correlation ( .507) is:

Lower 1952> -.019 1900< -.014 1920> -.012 1963< -.012 2008< -.011 1926< -.011 Higher 1953 .014 1981 .012

[D] 6 Absent rings: Year Master N series Absent

1969 -.913 12 1

1971 .511 12 2 >> WARNING: Ring is not usually narrow

1981 -.992 12 1

2008 .300 12 2 >> WARNING: Ring is not usually narrow

2009 .844 12 2 >> WARNING: Ring is not usually narrow

2010 1.178 12 2 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

1920 +3.7 SD; 1938 +3.1 SD

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155A 1918 to 2010 93 years Series 7

[B] Entire series, effect on correlation ( .670) is:

Lower 1920< -.021 1953> -.019 1981> -.017 2006< -.014 1999> -.012 1942> -.009 Higher 1933 .043 2003 .026

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

1981 +3.1 SD

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155B 1885 to 2010 126 years Series 8

[\*] Early part of series cannot be checked from 1885 to 1897 -- not matched by another series

[B] Entire series, effect on correlation ( .626) is:

Lower 1994< -.015 1900> -.015 1946> -.012 1951< -.011 2004> -.010 2010< -.009 Higher 2003 .043 1933 .025

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900A 1943 to 2010 68 years Series 9

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

Lower 1965< -.034 1997< -.019 1994> -.015 1943< -.014 1960> -.012 1952< -.010 Higher 2003 .103 1951 .012

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900B 1940 to 2010 71 years Series 10

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

Lower 1966> -.034 1953> -.030 1946> -.019 1977< -.017 1958< -.014 1964> -.011 Higher 2003 .043 1945 .015

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

1966 +4.3 SD

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0277A 1937 to 2010 74 years Series 11

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

Lower 1980< -.019 1998< -.014 1994> -.013 1943> -.013 1951< -.012 1966< -.008 Higher 2003 .019 1945 .014

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0277B 1936 to 2010 75 years Series 12

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

Lower 1940> -.021 1962> -.018 1936< -.016 1944> -.015 1994> -.014 1990< -.012 Higher 2003 .052 1937 .018

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

1944 +3.2 SD

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PART 7: DESCRIPTIVE STATISTICS: 12:20 Tue 05 Apr 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 151A 1923 2010 88 4 1 .417 1.09 3.83 .849 .890 .265 2.70 .475 .029 1

2 151B 1919 2010 92 4 0 .506 1.08 4.39 .915 .860 .294 2.87 .440 .015 1

3 152A 1946 2010 65 3 0 .634 2.18 4.78 1.120 .845 .241 2.62 .458 -.042 1

4 152B 1942 2010 69 3 0 .668 1.96 4.71 .925 .827 .225 2.54 .435 -.013 1

5 154A 1940 2010 71 3 0 .366 1.32 3.57 .982 .776 .366 2.88 .439 .026 2

6 154B 1898 2010 113 5 0 .507 1.20 4.09 .937 .832 .430 2.84 .458 -.039 1

7 155A 1918 2010 93 4 0 .670 1.85 4.40 .976 .817 .259 2.71 .468 -.099 1

8 155B 1885 2010 126 5 0 .626 1.88 5.20 1.199 .872 .244 2.54 .372 -.065 1

9 900A 1943 2010 68 3 0 .644 1.34 3.71 .739 .816 .230 2.57 .458 -.007 1

10 900B 1940 2010 71 3 0 .556 1.16 3.22 .732 .884 .250 2.69 .533 -.085 1

11 0277A 1937 2010 74 3 0 .744 1.69 4.11 .838 .735 .309 3.02 .672 -.078 1

12 0277B 1936 2010 75 3 0 .628 1.15 3.06 .573 .737 .272 2.88 .667 .045 1

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

Total or mean: 1005 43 1 .577 1.49 5.20 .916 .828 .286 3.02 .482 -.028

- = [ COFECHA 174\_2COF ] = -