[] Dendrochronology Program Library Run PMCAO Program COF 13:30 Tue 19 Apr 2016 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 29696

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: pmcaov.txt

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 1886 to 2012 127 years

Continuous time span is 1886 to 2012 127 years

Portion with two or more series is 1889 to 2012 124 years

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

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

\*O\* Master series 1886 2012 127 yrs \*O\*

\*F\* Total rings in all series 1347 \*F\*

\*E\* Total dated rings checked 1344 \*E\*

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

\*H\* Average mean sensitivity .308 \*H\*

\*A\* Segments, possible problems 2 \*A\*

\*\*\* Mean length of series 112.3 \*\*\*

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

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: 13:30 Tue 19 Apr 2016 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

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

. . . . . . . . . . . . . . . . . <========>. . PMO1A 1 1900 1998 99

. . . . . . . . . . . . . . . . . <========>. . PMO1B 2 1900 1998 99

. . . . . . . . . . . . . . . . . <==========> . PMO2A 3 1908 2012 105

. . . . . . . . . . . . . . . . . .<=========> . PMO2B 4 1919 2012 94

. . . . . . . . . . . . . . . . . <==========> . PMO3A 5 1906 2012 107

. . . . . . . . . . . . . . . . . <===========> . PMO3B 6 1898 2012 115

. . . . . . . . . . . . . . . . . <===========> . PMO4A 7 1897 2012 116

. . . . . . . . . . . . . . . . . <============> . PMO4B 8 1886 2012 127

. . . . . . . . . . . . . . . . . <===========> . PMO5A 9 1891 2012 122

. . . . . . . . . . . . . . . . . <============> . PMO5B 10 1889 2012 124

. . . . . . . . . . . . . . . . . <===========> . PMO6A 11 1891 2012 122

. . . . . . . . . . . . . . . . . <===========> . PMO6B 12 1896 2012 117

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

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: 13:30 Tue 19 Apr 2016 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 .688 9 1950 .381 12 2000 1.522 10

1901 -1.222 9 1951 .571 12 2001 .550 10

1902 .843 9 1952 -.541 12 2002 .612 10

1903 .862 9 1953 -1.446 12 2003 -.853 10

1904 .194 9 1954 -.348 12 2004 .548 10

1905 .208 9 1955 -.037 12 2005 -.481 10

1906 -.582 10 1956 -.503 12 2006 .866 10

1907 .496 10 1957 -.666 12 2007 -2.213 10

1908 -1.411 11 1958 1.029 12 2008 -.461 10

1909 -.195 11 1959 .581 12 2009 1.240 10

1910 .908 11 1960 1.864 12 2010 1.055 10

1911 -1.380 11 1961 -1.162 12 2011 -.216 10

1912 .926 11 1962 .859 12 2012 -1.146 10

1913 -.388 11 1963 -.085 12

1914 -.840 11 1964 -.302 12

1915 1.693 11 1965 -.118 12

1916 1.471 11 1966 -.032 12

1917 1.247 11 1967 -.506 12

1918 -.363 11 1968 -.480 12

1919 .222 12 1969 -.562 12

1920 -.033 12 1970 -.343 12

1921 -1.908 12 1971 .270 12

1922 -.138 12 1972 -.626 12

1923 -.023 12 1973 2.095 12

1924 .379 12 1974 1.662 12

1925 -1.629 12 1975 .397 12

1926 -.038 12 1976 1.079 12

1927 1.596 12 1977 -.712 12

1928 1.472 12 1978 -.292 12

1929 .364 12 1979 -.345 12

1930 -.366 12 1980 .671 12

1931 -1.057 12 1981 -1.966 12

1932 .786 12 1982 -.625 12

1933 -.501 12 1983 .312 12

1934 -.515 12 1984 -1.110 12

1935 .652 12 1985 -.844 12

1886 -3.700 1 1936 -1.720 12 1986 .958 12

1887 .494 1 1937 -2.395 12 1987 -1.541 12

1888 -1.167 1 1938 1.527 12 1988 -.401 12

1889 -.438 2 1939 1.068 12 1989 .680 12

1890 .927 2 1940 .444 12 1990 .439 12

1891 .554 4 1941 -.895 12 1991 -1.634 12

1892 1.758 4 1942 .841 12 1992 .773 12

1893 .079 4 1943 -.617 12 1993 .840 12

1894 -.484 4 1944 -1.538 12 1994 -.740 12

1895 .230 4 1945 1.312 12 1995 .492 12

1896 .289 5 1946 .803 12 1996 .197 12

1897 -.191 6 1947 .255 12 1997 -.471 12

1898 -1.314 7 1948 1.125 12 1998 .461 12

1899 -.454 7 1949 .372 12 1999 1.222 10

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PART 4: Master Bar Plot: 13:30 Tue 19 Apr 2016 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-------C 1950------B 2000----------F

1901-e 1951-------B 2001-------B

1902--------C 1952---b 2002-------B

1903--------C 1953f 2003--c

1904------A 1954----a 2004-------B

1905------A 1955-----@ 2005---b

1906--b 1956---b 2006--------C

1907-------B 1957--c 2007i

1908f 1958---------D 2008---b

1909----a 1959-------B 2009---------E

1910--------D 1960----------G 2010---------D

1911-f 1961-e 2011----a

1912--------D 1962--------C 2012-e

1913---b 1963-----@

1914--c 1964----a

1915----------G 1965-----@

1916----------F 1966-----@

1917---------E 1967---b

1918----a 1968---b

1919------A 1969--b

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

1921h 1971------A

1922-----a 1972--c

1923-----@ 1973----------H

1924------B 1974----------G

1925g 1975------B

1926-----@ 1976---------D

1927----------F 1977--c

1928----------F 1978----a

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

1930----a 1980-------C

1931-d 1981h

1932--------C 1982--b

1933---b 1983------A

1934---b 1984-d

1935-------C 1985--c

1886o 1936g 1986---------D

1887-------B 1937j 1987f

1888-e 1938----------F 1988---b

1889---b 1939---------D 1989-------C

1890--------D 1940------B 1990------B

1891-------B 1941-d 1991g

1892----------G 1942--------C 1992--------C

1893-----@ 1943--b 1993--------C

1894---b 1944f 1994--c

1895------A 1945---------E 1995-------B

1896------A 1946--------C 1996------A

1897----a 1947------A 1997---b

1898-e 1948---------D 1998------B

1899---b 1949------A 1999---------E

PART 5: CORRELATION OF SERIES BY SEGMENTS: 13:30 Tue 19 Apr 2016 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 PMO1A 1900 1998 .67 .63 .48

2 PMO1B 1900 1998 .65 .51 .03B

3 PMO2A 1908 2012 .74 .73 .75 .79

4 PMO2B 1919 2012 .78 .79 .73 .78

5 PMO3A 1906 2012 .68 .76 .62 .51

6 PMO3B 1898 2012 .71 .74 .78 .79 .82

7 PMO4A 1897 2012 .49 .49 .60 .39 .51

8 PMO4B 1886 2012 .52 .64 .47 .38 .46

9 PMO5A 1891 2012 .56 .43 .44 .51 .49

10 PMO5B 1889 2012 .45 .35 .30A .56 .48

11 PMO6A 1891 2012 .70 .76 .67 .52 .53

12 PMO6B 1896 2012 .66 .69 .75 .65 .61

Av segment correlation .58 .63 .62 .53 .60

PART 6: POTENTIAL PROBLEMS: 13:30 Tue 19 Apr 2016 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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PMO1A 1900 to 1998 99 years Series 1

[B] Entire series, effect on correlation ( .585) is:

Lower 1971< -.022 1903< -.018 1943> -.016 1988< -.016 1938< -.015 1977> -.011 Higher 1937 .036 1981 .021

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

PMO1B 1900 to 1998 99 years Series 2

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

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

1949 1998 4 .06 .05 .13 -.14 .11 .11 -.11 -.16 .16 -.08 .03| .10 .06 -.22 .31\*-.15 -.19 .06 .09 -.18 -.04

[B] Entire series, effect on correlation ( .356) is:

Lower 1981> -.074 1995< -.024 1984> -.023 1994> -.019 1938< -.017 1961> -.013 Higher 1937 .064 1936 .029

1949 to 1998 segment:

Lower 1981> -.122 1995< -.040 1984> -.035 1994> -.028 1976< -.018 1956> -.015 Higher 1987 .081 1973 .061

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

1981 +5.0 SD

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

PMO2A 1908 to 2012 105 years Series 3

[B] Entire series, effect on correlation ( .763) is:

Lower 1929< -.011 1962< -.008 1998> -.008 1944> -.007 1954< -.007 1957> -.006 Higher 1981 .014 2007 .011

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

PMO2B 1919 to 2012 94 years Series 4

[B] Entire series, effect on correlation ( .794) is:

Lower 1957> -.016 1962< -.013 2011> -.013 1968> -.010 1990> -.008 1992< -.006 Higher 1937 .016 1981 .012

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

PMO3A 1906 to 2012 107 years Series 5

[B] Entire series, effect on correlation ( .607) is:

Lower 2007> -.024 1910< -.023 2001< -.018 1956> -.017 1911> -.017 1936> -.015 Higher 1937 .030 1981 .022

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PMO3B 1898 to 2012 115 years Series 6

[B] Entire series, effect on correlation ( .754) is:

Lower 1936> -.017 1956> -.012 1898> -.012 1907< -.011 2008< -.008 1905> -.006 Higher 1937 .017 2007 .011

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

PMO4A 1897 to 2012 116 years Series 7

[B] Entire series, effect on correlation ( .478) is:

Lower 1905< -.085 1981> -.016 1958< -.015 1961> -.010 1959< -.010 2004< -.009 Higher 1936 .024 2007 .021

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

1905 -5.5 SD

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PMO4B 1886 to 2012 127 years Series 8

[\*] Early part of series cannot be checked from 1886 to 1888 -- not matched by another series

[B] Entire series, effect on correlation ( .473) is:

Lower 1952< -.020 1899< -.018 1976< -.016 2011> -.012 1953> -.012 2005< -.011 Higher 1936 .024 1921 .016

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

PMO5A 1891 to 2012 122 years Series 9

[B] Entire series, effect on correlation ( .485) is:

Lower 1937> -.029 1943< -.027 1996< -.026 1950< -.013 1941> -.013 1931> -.010 Higher 1921 .014 1925 .014

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PMO5B 1889 to 2012 124 years Series 10

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

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1925 1974 0 .16 .18 -.16 -.05 .06 -.04 -.15 .07 .03 -.34 .30\* .19 -.20 -.11 -.06 .05 -.17 -.07 .03 -.15 -.03

[B] Entire series, effect on correlation ( .434) is:

Lower 1937> -.066 1946< -.043 2003> -.009 1987> -.009 2005> -.009 1999< -.008 Higher 1981 .027 2007 .025

1925 to 1974 segment:

Lower 1937> -.151 1946< -.109 1934> -.014 1962< -.013 1930> -.010 1939< -.009 Higher 1960 .037 1973 .035

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

1937 +4.6 SD; 2007 -4.7 SD

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PMO6A 1891 to 2012 122 years Series 11

[B] Entire series, effect on correlation ( .605) is:

Lower 1956> -.015 1891< -.013 1984> -.013 1952> -.009 1945< -.009 1987> -.008 Higher 1981 .018 1937 .018

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PMO6B 1896 to 2012 117 years Series 12

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

Lower 1911> -.017 1952> -.015 1977> -.014 2005> -.012 2007> -.009 1896> -.008 Higher 1937 .018 1908 .012

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PART 7: DESCRIPTIVE STATISTICS: 13:30 Tue 19 Apr 2016 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 PMO1A 1900 1998 99 3 0 .585 1.30 4.49 .701 .580 .284 2.75 .529 .035 2

2 PMO1B 1900 1998 99 3 1 .356 1.03 4.81 .682 .671 .241 2.82 .438 .059 2

3 PMO2A 1908 2012 105 4 0 .763 1.72 4.02 .758 .440 .330 2.88 .583 -.054 1

4 PMO2B 1919 2012 94 4 0 .794 2.09 4.18 .818 .194 .411 2.72 .552 -.021 1

5 PMO3A 1906 2012 107 4 0 .607 2.25 5.29 .940 .295 .352 2.90 .522 -.037 1

6 PMO3B 1898 2012 115 5 0 .754 2.05 4.66 .873 .437 .319 2.74 .511 -.082 1

7 PMO4A 1897 2012 116 5 0 .478 1.69 4.44 .838 .619 .305 2.61 .417 -.033 2

8 PMO4B 1886 2012 127 5 0 .473 1.58 3.89 .753 .715 .300 2.70 .521 -.006 1

9 PMO5A 1891 2012 122 5 0 .485 1.13 2.26 .507 .640 .323 2.60 .424 -.013 1

10 PMO5B 1889 2012 124 5 1 .434 .82 2.15 .317 .649 .266 2.59 .368 -.063 2

11 PMO6A 1891 2012 122 5 0 .605 1.54 3.53 .717 .604 .289 2.55 .461 -.013 1

12 PMO6B 1896 2012 117 5 0 .638 1.39 3.47 .594 .533 .296 2.75 .490 -.007 1

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Total or mean: 1347 53 2 .577 1.54 5.29 .702 .540 .308 2.90 .482 -.021

- = [ COFECHA PMCAOCOF ] = -